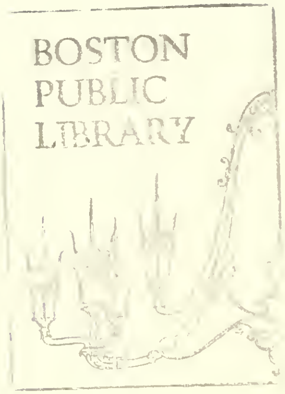

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Final Project Impact Report
Final Environmental Impact Report

for
New England Medical Center Hospitals, Inc.
1-C Project Phase I
750 Washington Street
Boston, Massachusetts

APPENDICES
VOLUME I

July 1992

FINAL PROJECT IMPACT REPORT
FINAL ENVIRONMENTAL IMPACT REPORT
FOR
NEW ENGLAND MEDICAL CENTER HOSPITALS, INC.
1-C PROJECT PHASE I

•

750 WASHINGTON STREET
BOSTON, MASSACHUSETTS

APPENDICES
VOLUME I

EOEA # 7966
July 1992

Submitted to:

THE BOSTON REDEVELOPMENT AUTHORITY
MASSACHUSETTS EXECUTIVE OFFICE OF ENVIRONMENTAL AFFAIRS

EXECUTIVE OFFICE OF ENVIRONMENTAL AFFAIRS NUMBER: 7966

Submitted by:

NEW ENGLAND MEDICAL CENTER HOSPITALS, INC.
750 Washington Street
Boston, MA 02111

Prepared by:

Carr, Lynch, Hack and Sandell, Inc.
Shepley Bulfinch Richardson and Abbott Architects
Frank Durgin, PE
Howard/Stein-Hudson
Parsons, Brinckerhoff, Quade and Douglas
Haley & Aldrich

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APPENDICES - VOLUME II (BOUND SEPARATELY)

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N TRANSPORTATION: ADDITIONAL DATA

1.0 SUMMARY

1.1 Project:

New England Medical Center Hospitals, Inc.
1-C Project Phase 1
Boston, Massachusetts

1.2 Project Description:

The proposed project is the first phase of the 1-C Project outlined in the New England Medical Center Hospitals (NEMCH) Master Plan 1990-2000. The 1-C Project Phase 1 includes new construction for inpatient and ambulatory care services to be located at 750 Washington Street, within the campus of the NEMCH. The project calls for two connected eight-story buildings: 1-C North and 1-C South. A three-story atrium will be featured as part of 1-C North, and will serve as a focal point between the existing NEMCH facilities and the new project, and as a public amenity for pedestrians. The total floor area of the project will be 371,206 FAR gross square feet.

The proposed project has evolved since the publication of the Environmental Notification Form submitted in September 1989, the Project Notification Form submitted in December 1990, and the Master Plan 1900-2000, dated March 1990. The previous program included a research component, which will now be housed off-site. A community hospital, originally planned for the 1-C project, is now being planned for the Pratt Building. The building floor area is enlarged from the previous proposal, but is well within the 718,919 square foot ceiling as defined in the approved Master Plan and the FAR of 8.0 for this site allowed as a result of following the Article 31 review process. Another change includes the relocation of the emergency department entrance from Washington Street to Nassau Street, a non-residential cross street within the NEMCH campus.

While several alternatives were explored in the early schematic phase of design, these were not pursued further because they did not offer significant advantages over the preferred scheme. They in fact had a number of disadvantages, including inefficient circulation and a large apparent building mass.

1.3 Status of Federal, State and Local Permits:

A list of Federal, State and Local permits and a description of their status is provided.

1.4 Summary of Environmental Effects and Mitigation Measures:

The project will offer a number of public benefits to the City and the surrounding communities. These benefits include job opportunities and training, housing linkage payments, public amenities, and the continuation of payments in lieu of taxes (PILOT).

The proposed project will improve the urban context along Washington Street by emphasizing the city block pattern, strengthening the street wall at the pedestrian level, and improving pedestrian routes through the area. The massing of the program will be expressed as two distinct but related buildings, linked by a bridge over the newly extended Nassau Street. The proposed project will improve pedestrian access to the Orange Line public transit station through the public atrium, and will provide new landscaping and lighting along the adjacent sidewalks.

Local traffic will be improved by the relocation of the existing ambulance drop-off from Harrison Avenue to Nassau Street, a minor street within the NEMCH campus. Throughout the Master Plan period (1990 - 2000), the 1-C Project Phase 1 will be contributing a relatively minor portion of traffic to the city streets and surrounding expressways and ramps. Parking needs generated as a result of 1-C Phase 1 will be met in a parking garage to be developed south of the Massachusetts Turnpike. There will be no noticeable impact on the capacity of any transit line.

Since the project site is now vacant, the construction of any building in this location will change the nature of the site. However, the expected daylight obstruction from the proposed building is within the range typically found in urban areas and new shadows will fall on the adjacent sidewalks but not on any existing or potential open spaces in the area. Pedestrian level winds will be comfortable around the building and at its entrances, with some increased windiness near the southern corners of the 1-C building and reduced windiness away from the site. The proposed building falls within the envelope allowed by the Chinatown permanent zoning and is consistent with the objectives of the Chinatown Plan.

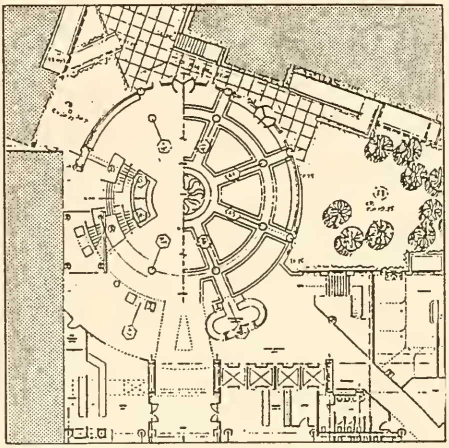
The site abuts the National Register (NR) Theatre Area Multiple Resource Nomination District and the NR eligible Chinatown District; however, the Massachusetts Historical Commission has determined that no additional action will be taken in the review of the proposed project at this time. The Boston Landmarks Commission has stated that the project will have little or no impact on significant archeological resources.

The building design and construction methods are planned to minimize adverse impacts to the surrounding urban environment. NEMCH and their contractor will work closely with the Boston Transportation Department (BTD) and other appropriate City agencies to prepare a detailed Construction Management Plan for approval by the BTD prior to the beginning of construction. The design and construction of the foundations will have no significant effects on adjacent structures, utilities or groundwater levels. Ongoing programs for solid waste disposal, recycling, and rodent control will be expanded to encompass the new facility.

While hazardous contaminants were discovered in the surficial fill soils on the site, the types and levels were typical of urban industrialized zones. A waiver was submitted in accordance with the Massachusetts Contingency Plan and was approved by the Department of Environmental Protection.

Given the minimum change in projected traffic volumes, noise levels may decrease over future no-build conditions and air quality will not significantly deteriorate due to the proposed project. Mechanical equipment will be housed on the building roofs, away from noise sensitive receptors.

The utilities systems serving the site have adequate capacity to accommodate the new project's demands. While water use and sewage generation will increase over historical site usage, water conservation elements are expected to minimize water use by 15 percent and sewage generation by twenty percent. Similarly, by employing energy conservation measures, both electricity and steam will be used more efficiently in the new buildings



Appendix A: Financial Information

Rating: Standard & Poor's: "AAA"
Moody's: "Aaa"
Fitch: "AAA"
Financial Guaranty
Insured

NEW ISSUE

In the opinion of Bond Counsel, under existing law interest on the Series F Bonds (including any original issue discount properly allocable to the owners of the Series F Bonds) is excluded from the gross income of the owners of the Series F Bonds for federal income tax purposes, assuming continued compliance by the Authority and the Institution with the Internal Revenue Code of 1986, as amended. Interest on the Series F Bonds is not an item of tax preference for purposes of the federal alternative minimum tax imposed on individuals and corporations. However, interest on the Series F Bonds will be taken into account in determining adjusted current earnings for the purpose of computing the alternative minimum tax imposed on corporations. Income on the Series F Bonds, including any profit made on the sale thereof, is exempt from Massachusetts personal income taxes although the Series F Bonds and any income thereon may be included in the measure of Massachusetts estate and inheritance taxes and of certain Massachusetts corporation excise and franchise taxes. See "TAX EXEMPTION" herein.

NEW ENGLAND MEDICAL
CENTER HOSPITALS

$113,745,000

MASSACHUSETTS HEALTH AND EDUCATIONAL FACILITIES AUTHORITY

Revenue Bonds, New England Medical Center Hospitals Issue, Series F

Dated: February 1, 1992 **Due: July 1, as shown below**

Principal and semiannual interest on the Series F Bonds will be paid by BayBank, Burlington, Massachusetts, as Trustee and Paying Agent for the Series F Bonds (the "Trustee"). The Series F Bonds will be initially issued as fully registered bonds, registered in the name of Cede & Co. as nominee of The Depository Trust Company ("DTC"), New York, New York. DTC will act as the securities depository for the Series F Bonds. The Series F Bonds will be issued in denominations of $5,000 and multiples thereof. So long as DTC or its nominee, Cede & Co., is the Bondowner, such payments will be made directly to such Bondowner as more fully described herein. Interest will be payable on July 1, 1992 and semiannually thereafter on January 1 and July 1 to the Bondowners of record as of the close of business on the fifteenth day of the month preceding such interest payment date.

THE SERIES F BONDS ARE SUBJECT TO REDEMPTION PRIOR TO MATURITY, INCLUDING SPECIAL REDEMPTION AT PAR IN CERTAIN CIRCUMSTANCES, AS SET FORTH IN THIS OFFICIAL STATEMENT.

The Series F Bonds shall be special obligations of the Massachusetts Health and Educational Facilities Authority (the "Authority") payable solely from the Revenues (as defined herein) of the Authority, including payments to the Trustee, for the account of the Authority, by New England Medical Center Hospitals, Inc. (the "Institution") in accordance with the provisions of the Agreement (as defined herein). Such payments shall be in the amounts sufficient to pay, when due, interest together with maturing principal of the Series F Bonds or the applicable sinking fund installment, all in accordance with the Agreement. The payments pursuant to the Agreement are a general obligation of the Institution. Reference is hereby made to this Official Statement for pertinent security provisions of the Series F Bonds.

THE SERIES F BONDS SHALL NOT BE DEEMED TO CONSTITUTE A DEBT OR LIABILITY OF THE COMMONWEALTH OF MASSACHUSETTS OR ANY POLITICAL SUBDIVISION THEREOF OR A PLEDGE OF THE FAITH AND CREDIT OF THE COMMONWEALTH OF MASSACHUSETTS OR ANY SUCH POLITICAL SUBDIVISION, BUT SHALL BE PAYABLE SOLELY FROM THE REVENUES PROVIDED UNDER THE AGREEMENT. NEITHER THE FAITH AND CREDIT NOR THE TAXING POWER OF THE COMMONWEALTH OF MASSACHUSETTS OR ANY POLITICAL SUBDIVISION THEREOF IS PLEDGED TO THE PAYMENT OF THE PRINCIPAL OF OR INTEREST ON THE SERIES F BONDS. THE ACT DOES NOT IN ANY WAY CREATE A SO-CALLED MORAL OBLIGATION OF THE COMMONWEALTH OF MASSACHUSETTS TO PAY DEBT SERVICE IN THE EVENT OF DEFAULT BY THE INSTITUTION. THE AUTHORITY DOES NOT HAVE ANY TAXING POWER.

The payment of the principal of and interest on the Series F Bonds when due will be insured by a municipal bond insurance policy to be issued by Financial Guaranty Insurance Company simultaneously with the delivery of the Series F Bonds.

FGIC℠ Financial Guaranty Insurance Company

Service mark used by Financial Guaranty Insurance Company, a private company not affiliated with any U.S. government agency.

AMOUNTS, MATURITIES, INTEREST RATES AND PRICES OR YIELDS

Amount	Due July 1	Interest Rate	Price or Yield
$1,410,000	1996	4.90%	100%
1,480,000	1997	5.15	100
1,560,000	1998	5.40	100
1,640,000	1999	5.60	100
1,735,000	2000	5 ¾	5.80
1,830,000	2001	5.80	5.90
$1,935,000	2002	5.90%	6 %
2,055,000	2003	6	6.10
2,180,000	2004	6.10	6.20
2,305,000	2005	6.20	6.30
2,455,000	2006	6.30	6.40

$18,405,000 6½% Term Bonds due July 1, 2012 — Price 98¾%
$74,755,000 6⅝% Term Bonds due July 1, 2025 — Price 99%
(Accrued interest from February 1, 1992 to be added)

The Bonds will be offered when, as and if issued and accepted by the Underwriters, subject to prior sale, to withdrawal or modification of the offer without notice, and to an opinion as to legality by Palmer & Dodge, Boston, Massachusetts, Bond Counsel. Certain legal matters are subject to the approval of Ropes & Gray, Boston, Massachusetts, as counsel to the Institution. Certain legal matters will be passed upon for the Underwriters by their counsel, Choate, Hall & Stewart, Boston, Massachusetts. It is expected that the Bonds will be available for delivery to DTC in New York, New York on or about March 5, 1992.

Kidder, Peabody & Co.
Incorporated

Lazard Frères & Co.

BayBank Boston, N.A. **M. R. Beal & Company** **Goldman, Sachs & Co.**

February 13, 1992

IN CONNECTION WITH THIS OFFERING, THE UNDERWRITERS MAY OVER-ALLOT OR EFFECT TRANSACTIONS WHICH STABILIZE OR MAINTAIN THE MARKET PRICE OF THE SERIES F BONDS AT LEVELS ABOVE THOSE WHICH MIGHT OTHERWISE PREVAIL IN THE OPEN MARKET. SUCH STABILIZING, IF COMMENCED, MAY BE DISCONTINUED AT ANY TIME.

No dealer, broker, salesperson or other person has been authorized by the Authority, the Institution, or the Underwriters to give information or to make representations with respect to the Series F Bonds, other than those contained in this Official Statement, and if given or made, such other information or representations must not be relied upon as having been authorized by any of the foregoing. This Official Statement does not constitute an offer by any person to sell or the solicitation by any person of an offer to buy, nor shall there be any sale of the Series F Bonds by any person in any jurisdiction in which it is unlawful for such person to make such offer, solicitation or sale.

Certain information contained herein has been obtained from the Institution, The Depository Trust Company, Financial Guaranty Insurance Company and other sources which are believed to be reliable, but is not guaranteed as to accuracy or completeness, and is not to be construed as a representation of the Authority or the Underwriters. The information and expressions of opinion herein are subject to change without notice and neither the delivery of this Official Statement nor any sale made hereunder shall, under any circumstances, create any implication that there has been no change in the affairs of the parties referred to above since the date hereof.

NOTICE TO NEW HAMPSHIRE INVESTORS: IN MAKING AN INVESTMENT DECISION, INVESTORS MUST RELY ON THEIR OWN EXAMINATION OF THE ISSUER AND THE TERMS OF THE OFFERING, INCLUDING THE MERITS AND RISKS INVOLVED. THE SECURITIES DESCRIBED IN THIS OFFICIAL STATEMENT HAVE NOT BEEN RECOMMENDED BY ANY FEDERAL OR STATE SECURITIES COMMISSION OR REGULATORY AUTHORITY. FURTHERMORE, THE FOREGOING AUTHORITIES HAVE NOT CONFIRMED THE ACCURACY OR DETERMINED THE ADEQUACY OF THIS OFFICIAL STATEMENT. ANY REPRESENTATION TO THE CONTRARY IS A CRIMINAL OFFENSE.

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MASSACHUSETTS HEALTH AND EDUCATIONAL FACILITIES AUTHORITY

99 SUMMER STREET, BOSTON, MASSACHUSETTS 02110

C. VINCENT VAPPI, Chairman
ROBERT R. FANNING, JR., Vice Chairman
JOHN R. SMITH, Secretary
PRUDENCE S. CROZIER
CATHERINE M. DUNHAM
ROBERT E. FLYNN
HERMAN B. LEONARD
JOSEPH G. SNEIDER
GAIL SNOWDEN

EDWARD M. MURPHY, Executive Director

OFFICIAL STATEMENT

Relating to

$113,745,000

MASSACHUSETTS HEALTH AND EDUCATIONAL FACILITIES AUTHORITY
Revenue Bonds, New England Medical Center Hospitals
Issue, Series F

INTRODUCTION

Purpose of this Official Statement

The purpose of this Official Statement is to set forth certain information concerning the Massachusetts Health and Educational Facilities Authority (the "Authority"), New England Medical Center Hospitals, Inc. (the "Institution") and the $113,745,000 Massachusetts Health and Educational Facilities Authority Revenue Bonds, New England Medical Center Hospitals Issue, Series F (the "Series F Bonds") issued under the Mortgage and Trust Agreement (the "Mortgage and Trust Agreement") dated as of September 2, 1986 among the Authority, the Institution and The First National Bank of Boston, as trustee (the "Series D Trustee"), as amended and supplemented by the First Supplemental Agreement dated as of August 2, 1988 (the "First Supplemental Agreement") among the Authority, the Institution and BayBank Middlesex, as trustee (the "Series E Trustee"), as further amended and supplemented by the Second Supplemental Agreement dated as of January 7, 1992 (the "Second Supplemental Agreement") among the Authority, the Institution and BayBank, as trustee (the "Trustee") (collectively, the "Agreement"). The Series F Bonds are to be issued in accordance with the provisions of the Act and the Agreement. The information contained in this Official Statement is provided for use in connection with the initial sale of the Series F Bonds. The definitions of certain terms used and not defined herein are contained in Appendix C-1 "DEFINITIONS OF CERTAIN TERMS."

Plan of Financing

Proceeds of the Series F Bonds (including accrued interest on the Series F Bonds to the date of delivery) will be used to (1) pay interest accruing on the Series F Bonds from February 1, 1992 to the date of delivery of the Series F Bonds, (2) reimburse the Institution for certain capital expenditures incurred by the Institution in connection with the Project (as defined herein); (3) together with an equity contribution from the Institution of approximately $28,934,844 and the earnings on certain funds, provide funds necessary for the construction and equipping of the Project (as described under "THE PROJECT" herein); (4) provide for capitalized interest with respect to certain portions of the Project to the completion date of such portions of the Project; and (5) pay the costs of issuing the Series F Bonds.

A more detailed description of the use of proceeds of the Series F Bonds and other moneys and receipts, including approximate amounts and purposes, is included herein under "THE PROJECT" and "ESTIMATED SOURCES AND USES OF FUNDS."

Insurance for the Series F Bonds

Financial Guaranty Insurance Company ("Financial Guaranty") has committed to issue its Municipal Bond New Issue Insurance Policy for the Series F Bonds (the "Policy"), which will insure the payment of principal of and interest on the Series F Bonds on regularly scheduled payment dates (including sinking fund installments), to the extent such amounts are not paid by the Institution under the Agreement. Payments under the policy are subject to certain conditions. See "MUNICIPAL BOND INSURANCE" herein and Appendix E -- "SPECIMEN OF MUNICIPAL BOND INSURANCE POLICY."

SOURCES OF PAYMENT AND SECURITY FOR THE SERIES F BONDS

The Series F Bonds are issued pursuant to the Second Supplemental Agreement. The Agreement, to the extent permitted by law, constitutes a general obligation of the Institution and its full faith and credit is pledged to its performance. With respect to the Series F Bonds, the Agreement also provides, among other things, that the Institution is obligated to make payments to the Trustee in an amount equal to principal or sinking fund installments, as the case may be, interest and certain other payments required by the Agreement. The Agreement shall remain in full force and effect until such time as all of the bonds outstanding thereunder and the interest thereon have been fully paid or until adequate provision for such payments has been made.

The Series F Bonds are special obligations of the Authority, equally and ratably secured by and payable from a pledge of and lien on, to the extent provided by the Agreement, the moneys received with respect to the Series F Bonds by the Trustee for the account of the Authority pursuant to the Agreement, whether such moneys are received as Revenues paid or caused to be paid by the Institution pursuant to the Second Supplemental Agreement.

The Agreement provides for the establishment of a Debt Service Reserve Fund, which will not be funded at the time of issuance of the Bonds. In the event that the Institution fails to meet certain financial tests, the Debt Service Reserve Fund will be funded in an amount equal to the Debt Service Reserve Fund Requirement. See Appendix C-1--"DEFINITIONS OF CERTAIN TERMS" under the definition of "Series F Debt Service Reserve Fund Requirement."

The Series F Bonds constitute Alternative Indebtedness under the Agreement and will be secured initially by a lien upon the Mortgaged Property (as hereinafter defined) and a security interest in certain real and tangible personal property and a pledge of the Institution's Gross Receipts (as defined in the Agreement, and which is comprised of all revenues and receipts, other than gifts, grants or bequests), equally and ratably with the Series D Bonds (as hereinafter defined), the Series E Bonds (as hereinafter defined) and the Pool Loan (as hereinafter defined) as to the lien upon the Mortgaged Property and the Gross Receipts, as described below. The enforcement of the lien on Gross Receipts may be subject to a preference claim under the Bankruptcy Code, and to the exercise of discretion by a court of equity which, under certain circumstances, may have the power to direct the use of such receipts to meet expenses of the Institution before paying debt service. In addition, to the extent Gross Receipts includes accounts receivable and the proceeds thereof under the Medicare and Medicaid programs, the assignment of such accounts and proceeds to the Trustee may violate federal and state regulations concerning the assignability of such accounts and hence be unenforceable. See "BONDOWNERS' RISKS" under the heading "Enforceability of Lien on Gross Receipts" herein.

AS FURTHER DESCRIBED BELOW, THE AGREEMENT PROVIDES FOR THE RELEASE OF ALL LIENS AGAINST AND SECURITY INTERESTS IN THE MORTGAGED PROPERTY AND GROSS RECEIPTS OF THE INSTITUTION SECURING THE SERIES F BONDS, AS WELL AS CHANGES TO CERTAIN COVENANTS SET FORTH IN THE AGREEMENT, UPON THE OCCURRENCE OF

CERTAIN EVENTS. The Agreement contains restrictions on the creation of certain liens and encumbrances with respect to certain property of the Institution, with certain exceptions. See Appendix C-2 -- "SUMMARY OF THE AGREEMENT" under the heading "Encumbrances, Sale and Lease of Property." The Agreement also contains provisions permitting transfers of assets to be made upon compliance with certain tests and limiting the amount of certain transfers of assets which may be made by the Institution. See Appendix C-2 -- "SUMMARY OF THE AGREEMENT" under the heading "Encumbrance, Sale and Lease of Property; Borrowings" and Appendix C-3 -- "SUMMARY OF FUTURE AMENDMENTS TO THE AGREEMENT."

The Agreement contains provisions permitting the issuance of additional debt on a parity with the Series F Bonds and, following future amendments to the Agreement described in Appendix C-3, senior to, the Series F Bonds. See "ADDITIONAL INDEBTEDNESS" and Appendix C-2 -- "SUMMARY OF THE AGREEMENT" under the heading "Encumbrance, Sale and Lease of Property" and Appendix C-2 -- "SUMMARY OF FUTURE AMENDMENTS TO THE AGREEMENT."

The Series F Bonds shall not be deemed to constitute a debt, liability or moral obligation of The Commonwealth of Massachusetts (the "Commonwealth") or any political subdivision thereof, but shall be payable solely from the Revenues derived by the Authority under the Agreement. The Authority does not have taxing power.

The Institution has outstanding indebtedness that includes the Authority's Revenue Bonds, New England Medical Center Hospitals Issue, Series D (the "Series D Bonds") (initially issued in the amount of $88,795,000); the Authority's Revenue Bonds, New England Medical Center Hospitals Issue, Series E (the "Series E Bonds") (initially issued in the amount of $26,135,000) and a loan (the "Pool Loan") in the original principal amount of $15,400,000 made from a portion of the proceeds of the Authority's $145,500,000 Revenue Bonds, Capital Asset Program Issue, Series F. The Series D Bonds, the Series E Bonds and the Pool Loan are secured by a lien on the Institution's Gross Receipts and a mortgage on substantially all of the Institution's existing inpatient and outpatient acute care hospital facilities and certain research facilities, which mortgage will be expanded to include the real property on which the Project will be located (and the building and personalty thereon)(collectively, the "Mortgaged Property") at the time of issuance of the Series F Bonds. The Series F Bonds will be issued on a parity with the Series D Bonds, the Series E Bonds and the Pool Loan as to the lien upon the Mortgaged Property and Gross Receipts, but upon the occurrence of certain events described below, such liens will be released and the Pool Loan and all three such series, including the Series F Bonds, will become unsecured general obligations of the Institution. The Series F Bonds will not be secured by, and holders of the Series F Bonds have no right to participate in, any debt service reserve fund or excess depreciation fund established for the benefit of the holders of the Series D Bonds or the Series E Bonds.

The Series D Bonds were issued pursuant to the Mortgage and Trust Agreement and the Series E Bonds were issued pursuant to the Mortgage and Trust Agreement, as amended by the First Supplemental Agreement. The Mortgage and Trust Agreement, as amended by the First Supplemental Agreement, contains restrictions on the incurrence of additional indebtedness. Each of the Mortgage and Trust Agreement and the First Supplemental Agreement further provides that upon receipt of consent of two-thirds of the principal amount of the bonds outstanding issued thereunder, the agreements may be amended, with certain restrictions as set forth herein. The Institution may seek the consent of the credit facility for the Pool Loan and the holders of a sufficient percentage of the bonds outstanding under each of the Mortgage and Trust Agreement and the First Supplemental Agreement to certain amendments as described herein. The Second Supplemental Agreement provides that upon consent of the credit facility for the Pool Loan and amendment of the Mortgage and Trust Agreement and the First Supplemental Agreement, or upon defeasance of, or the complete satisfaction of all obligations with respect to, the Series D Bonds, the Series E Bonds and the Pool Loan, the security for the Series F Bonds (including the lien on the Mortgaged Property and the Gross Receipts) will be released and certain covenants applicable to the Institution effective as of the issuance of the Series F Bonds will be deemed revised without further action or consent by the owners of the Series F Bonds. There can be no assurance that the consent of the credit facility for the Pool Loan and the required percentage outstanding of the Series D Bonds and Series E Bonds will be obtained, and pending receipt of such consent, or the earlier defeasance, or complete satisfaction of all obligations with respect to, such Bonds and the Pool Loan, and the election by the Institution to amend the Mortgage and Trust Agreement and the First Supplemental Agreement, the covenants described in Appendix C-3 -- "SUMMARY OF FUTURE AMENDMENTS TO THE AGREEMENT" will not take effect.

The covenants that will change upon the amendment of the Mortgage and Trust Agreement and the First Supplemental Agreement include, but are not limited to, changes in the conditions upon which the Institution may undertake any of the following actions: the method by which the Total Principal and Interest Requirements is calculated; the incurrence of additional indebtedness; the granting of liens upon the Institution's property; the merger or consolidation of the Institution into or with one or more other entities; and the transfer of assets with a value in excess of stated amounts for less than fair market value. See Appendix C-3 -- "SUMMARY OF FUTURE AMENDMENTS TO THE AGREEMENT."

THE AUTHORITY

The Authority is a body politic and corporate and a public instrumentality of the Commonwealth organized and existing under and by virtue of the Act. The purpose of the Authority, as stated in the Act, is essentially to provide assistance for nonprofit institutions for higher education, nonprofit schools for the handicapped, nonprofit hospitals and their affiliates, nonprofit nursing homes and their affiliates, and nonprofit cultural institutions in the construction, financing, and refinancing of projects to be undertaken in relation to programs for such institutions.

Authority Membership and Organization

The Act provides that the Authority shall consist of nine members who shall be appointed by the Governor and shall be residents of the Commonwealth. At least two members shall be associated with institutions for higher education, at least two shall be associated with hospitals, at least one shall be knowledgeable in the field of state and municipal finance (by virtue of business or other association) and at least one shall be knowledgeable in the field of building construction. All Authority members serve without compensation, but are entitled to reimbursement for necessary expenses incurred in the performance of their duties as members of the Authority. The Authority shall elect annually one of its members to serve as Chairman and one to serve as Vice Chairman.

The members of the Authority are as follows:

C. VINCENT VAPPI, Chairman; term as member expires July 1, 1997.

Mr. Vappi, a resident of Cambridge, is Chairman and Chief Executive Officer of Vappi & Company, Inc. of Cambridge, Massachusetts, general building contractors. Mr. Vappi is a Trustee of the New England Deaconess Hospital, a member of the Corporation of Simmons College and a Director of The Boston Company, the John Hancock Mutual Life Insurance Company, the Tech/Ops Companies and Medical Area Service Corp. (MASCO).

ROBERT R. FANNING, JR., Vice Chairman; term as member expires July 1, 1995.

Mr. Fanning, a resident of Boxford, is President and Chief Executive Officer of Beverly Hospital and its parent corporation, Northeast Health Systems, Inc. He is a Fellow of the American College of Healthcare Executives and is currently Chairman-Elect Designate of that organization. Mr. Fanning is immediate past Chairman of the Massachusetts Hospital Association Board of Trustees and a current member of the Board of Trustees and the Executive Committee. He is also an outside Director of Health Care Property Investors, Inc., an equity-oriented real estate investment trust specializing in health care related facilities. Mr. Fanning is also a Director of the Warren Five Cents Savings Bank.

JOHN R. SMITH, Secretary; term as member expires July 1, 1993.

Mr. Smith, a resident of Sudbury, is President of New England Fiduciary Company. He had formerly been Vice President and Treasurer of Boston College until retiring in May 1991. He is a Director of the Massachusetts Higher Education Assistance Corporation, Treasurer of the Massachusetts Educational Financing Authority, a Trustee of the Advest/Advantage Funds and a former Trustee of Boston College High School. Before coming to Boston College, Mr. Smith was employed by Bendix Corporation and Raytheon Company in executive financial analysis and management positions. He is a Certified Public Accountant.

PRUDENCE S. CROZIER, Ph.D; term as member expires July 1, 1992.

Dr. Crozier, a resident of Wellesley, is a Trustee of Wellesley College and an Overseer of Newton Wellesley Hospital. Dr. Crozier was a Senior Economist with Data Resources, Inc. and a Principal of Wellesley Economic Research Group. Dr. Crozier has held teaching appointments at Wellesley College and Harvard University and is a member of the American Economic Association and the Boston Economic Club.

CATHERINE M. DUNHAM; term as member expires July 1, 1994.

Ms. Dunham, a resident of Cambridge, is currently serving as advisor to the President of the Robert Wood Johnson Foundation. Ms. Dunham formerly served as the Director of the Governor's Office of Human Resources. Prior to joining the staff of former Governor Dukakis, Ms. Dunham served as the Executive Director of the Massachusetts Council of Human Service Providers, Inc. Previously, Ms. Dunham was the Executive

Director of the Western Massachusetts Training Consortium, Inc., which she founded in 1974. Ms. Dunham had previously held faculty appointments in health and educational fields.

ROBERT E. FLYNN, M.D.; term as member expires July 1, 1993.

Dr. Flynn, a resident of Dedham, is President of Caritas Christi, Secretary of Health Care Services for the Archdiocese of Boston, and former Director of the Department of Medicine at Saint Elizabeth's Hospital of Boston. He is presently a Member of the Faculty Executive Committee of Tufts University School of Medicine and a Member of the Executive Committee of Tufts University School of Medicine Alumni Association. He is a Trustee of Good Samaritan Hospice and of five hospitals in eastern Massachusetts. His current memberships in medical societies include the Boston Society of Psychiatry and Neurology, the Massachusetts Medical Society and the American Medical Association, and he is a Fellow of the American Academy of Psychiatry and Neurology.

HERMAN B. LEONARD; term as member expires July 1, 1995.

Professor Leonard, a resident of Concord, is the Baker Professor of Public Sector Financial Management at Harvard University's John F. Kennedy School of Government. Professor Leonard was a member of the Governor's Council on Economic Policy of the State of Alaska, of the Governor's Advisory council on Infrastructure in Massachusetts and of the Senate Budget Committee Private Sector Advisory Committee on Infrastructure. He served as Chairman of the Massachusetts Governor's Task Force on Tuition Prepayment Plans, and on the National Academy of Sciences Committees on National Urban Policy and on the Superconducting Super Collider. He is currently a member of the Board of Directors of ENA - Recherches, the research affiliate of the Ecole Nationale d'Administration in France. Professor Leonard has been chief financial officer and chief executive officer of a human services agency and has served as director of several firms.

JOSEPH G. SNEIDER; term as member expires July 1, 1998.

Joseph G. Sneider, a resident of Newton, is Senior Vice President of the Olympic International Bank and Trust Company in Boston. He is also chairman of C&S Candy Company, based in Cambridge. Mr. Sneider served as a trustee of University Hospital in Boston. He has also served on a number of public boards and commissions, and he belongs to several civic associations.

GAIL SNOWDEN; term as member expires July 1, 1996.

Ms. Snowden, a resident of Newton, is Director of Boston First Banking at the Bank of Boston, where she has served in various capacities in training and lending for the last 20 years. Ms. Snowden has been active with a number of civic and business management organizations, including the National Association of Urban Bankers, for which she served as Chairman of the Advisory Committee, the Boston Urban Bankers Forum, for which she served as President, and Simmons Graduate School of Management, for which she served as Secretary of the Alumni Association.

Ms. Snowden has announced her intention to resign as a member of the Authority. A successor has not yet been named.

Staff and Advisors

EDWARD M. MURPHY, a resident of Needham, was appointed Executive Director of the Authority on May 1, 1989 and is responsible for the management of the Authority's affairs. Mr. Murphy served as the Commissioner of the Massachusetts Department of Mental Health from September 1985 through April 1989. From 1979 to 1985, he was the Commissioner at the Massachusetts Department of Youth Services. Mr. Murphy holds an A.B. degree from Boston College as well as M.A. and Ph.D. degrees from the University of Massachusetts at Amherst.

LYDIA CROWSON, designated as Deputy Director of the Authority on July 10, 1990, has been authorized to exercise all powers of the Executive Director.

MARTIN L. RAINFORD, In-House General Counsel to the Authority, was appointed Assistant Executive Director of the Authority on November 1, 1988, and at the direction or in the absence of the Executive Director, is authorized to exercise all powers of the Executive Director.

PALMER & DODGE, attorneys of Boston, Massachusetts, are serving as Bond Counsel to the Authority and will submit their approving opinion with regard to the legality of the Series F Bonds as provided by the Agreement in substantially the form attached hereto as Appendix D.

KRC RESOURCES, INC. and PUBLIC FINANCIAL MANAGEMENT, INC. are serving as financial consultants to the Authority. The financial consultants advise the Authority in connection with the issuance of its obligations and certain other financial matters.

The Act provides that the Authority may employ such other counsel, engineers, architects, accountants, construction and financial experts, or others as the Authority deems necessary.

Powers of the Authority

Under the Act, the Authority is authorized and empowered, among other things, directly or by and through a participating institution for higher education, a participating school for the handicapped, a participating hospital or hospital affiliate, a participating nursing home or a participating cultural institution as its agent, to acquire real and personal property and to take title thereto in its own name or in the name of one or more participants as its agent; to construct, reconstruct, remodel, maintain, manage, enlarge, alter, add to, repair, operate, lease, as lessee or lessor, and regulate any project; to enter into contracts for any or all of such purposes, or for the management and operation of a project; to issue bonds, bond anticipation notes and other obligations, and to fund or refund the same; to fix and revise from time to time and charge and collect rates, rents, fees and charges for the use of and for the services furnished or to be furnished by a project or any portion thereof and to enter into contracts in respect thereof; to establish rules and regulations for the use of a project or any portion thereof; to receive and accept from any public agency loans or grants for or in the aid of the construction of a project or any portion thereof; to mortgage any project and the site thereof for the benefit of the holders of revenue bonds issued to finance such project; to make loans to any participant for the cost of a project or to refund outstanding obligations, mortgages or advances issued, made or given by such participant, for the cost of a project; to charge participants its administrative costs and expenses incurred; to acquire any federally guaranteed security and to pledge or use such security to secure or provide for the repayment of its bonds; and to do all things necessary or convenient to carry out the purposes of the Act. Additionally, the Authority may undertake a joint project or projects for two or more participants.

Indebtedness of the Authority

The Authority has heretofore authorized and issued certain series of its revenue bonds for public and private colleges and universities, private hospitals and their affiliates, community providers, cultural institutions, schools for the handicapped and nursing homes in the Commonwealth. Each series of revenue bonds has been a special obligation of the Authority.

The Authority expects to enter into separate agreements with eligible institutions in the Commonwealth for the purpose of financing projects for such institutions. Each series of bonds issued by the Authority constitutes a separate obligation of the borrowing institutions for such series, and the general funds of the Authority are not pledged to any bonds or notes.

In 1989, a hospital defaulted on its payment obligations with respect to revenue bonds that were issued by the Authority on behalf of such hospital. The Department of Banking and Finance of the Florida Division of Securities generally requires disclosure by any governmental issuer of securities sold in Florida of defaults on any obligations of such issuer. Because the Institution has not had any affiliation with such hospital and the Series F Bonds are not secured by any revenues or property of such hospital or the Authority under the Agreement or any other document to which the Institution is a party, the Institution does not believe that the default described above is material to the issuance of the Series F Bonds; and detailed disclosure in this Official Statement with respect to the default is not deemed appropriate or material by the Authority.

THE SERIES F BONDS

Description of the Series F Bonds

The Series F Bonds will be dated February 1, 1992 and will bear interest from such date, payable on July 1, 1992, and on each January 1 and July 1 thereafter at the rates on the cover page hereof and will mature on July 1 of the indicated years and in the principal amounts shown on the cover page hereof.

For the retirement of the Series F Bonds due July 1, 2012, sinking fund installments shall be payable on July 1, 2007 and each July 1 thereafter as follows:

Year	Sinking Fund Installment
2007	$2,605,000
2008	$2,775,000
2009	$2,955,000
2010	$3,145,000
2011	$3,355,000
2012*	$3,570,000

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*/Final Maturity

For the retirement of the Series F Bonds due July 1, 2025, sinking fund installments shall be payable on July 1, 2013 and each July 1 thereafter as follows:

Year	Sinking Fund Installment
2013	$3,805,000
2014	$4,055,000
2015	$4,325,000
2016	$4,610,000
2017	$4,915,000
2018	$5,240,000
2019	$5,590,000
2020	$5,960,000
2021	$6,355,000
2022	$6,770,000
2023	$7,220,000
2024	$7,700,000
2025*	$8,210,000

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*/ Final Maturity

Subject to the provisions discussed under "THE SERIES F BONDS -- Book-Entry-Only System," the Series F Bonds are issuable as fully registered bonds without coupons in the minimum denomination of $5,000 or any multiple thereof. Principal or redemption premium, if any, of the Series F Bonds will be payable at the principal corporate trust office of the Paying Agent, and interest on the Series F Bonds will be paid by check or draft mailed to the registered owner as of the close of business on the fifteenth day of the month preceding the date on which the interest is to be paid (the "Record Date"), or by wire transfer, as provided in the Agreement.

Pledge of Revenues under the Agreement

Under the Agreement, the Authority assigns and pledges to the Trustee in trust upon the terms of the Agreement (i) all Revenues to be received from the Institution and (ii) all rights to receive such Revenues and the proceeds of such rights. Under the Act, to the extent authorized or permitted by law, the pledge of Revenues is valid and binding from the time when such pledge is made and the Revenues and all income and receipts earned on funds held by the Trustee for the account of the Authority shall immediately be subject to the lien of such pledge without any physical delivery thereof or further act, and the lien of such pledge shall be valid and binding as against all parties having claims of any kind in tort, contract, or otherwise against the Authority irrespective of whether such parties have notice thereof.

The assignment and pledge by the Authority does not include (i) the rights of the Authority pursuant to provisions for consent, concurrence, approval or other action by the Authority, notice to the Authority, or the filing of reports, certificates, or other documents with the Authority; or (ii) the powers of the Authority as stated in the Agreement to enforce the provisions thereof.

Principal, Sinking Fund Installments and Interest Requirements

The following table sets forth, for each respective year ending July 1, the amounts required to be made available by the Institution in such year for payment of the principal, sinking fund installments, interest and total debt service in such year on the Series F Bonds, total debt service on the Series D and Series E Bonds and the Pool Loan, and total debt service in such year on the Series D, Series E and Series F Bonds and the Pool Loan.

Year Ending July 1	Principal and Sinking Fund Installments on the Series F Bonds	Interest on Series F Bonds	Total Debt Service on Series F Bonds	Total Debt Service on Series D and E Bonds and Pool Loan	Total Debt Service on Series D, E and F Bonds and Pool Loan
1992	---	$3,060,065.10	$3,060,065.10	$12,100,080.00	$15,160,145.10
1993	---	7,344,156.25	7,344,156.25	12,051,480.00	19,395,636.25
1994	---	7,344,156.25	7,344,156.25	12,202,505.00	19,546,661.25
1995	---	7,344,156.25	7,344,156.25	12,140,625.00	19,484,781.25
1996	$1,410,000	7,344,156.25	8,754,156.25	12,173,942.50	20,928,098.75
1997	1,480,000	7,275,066.25	8,755,066.25	12,200,987.50	20,956,053.75
1998	1,560,000	7,198,846.25	8,758,846.25	12,213,137.50	20,971,983.75
1999	1,640,000	7,114,606.25	8,754,606.25	12,232,857.50	20,987,463.75
2000	1,735,000	7,022,766.25	8,757,766.25	12,231,892.50	20,989,658.75
2001	1,830,000	6,923,003.75	8,753,003.75	12,225,767.50	20,978,771.25
2002	1,935,000	6,816,863.75	8,751,863.75	12,308,177.50	21,060,041.25
2003	2,055,000	6,702,698.75	8,757,698.75	12,276,927.50	21,034,626.25
2004	2,180,000	6,579,398.75	8,759,398.75	10,262,117.50	19,021,516.25
2005	2,305,000	6,446,418.75	8,751,418.75	10,266,975.00	19,018,393.75
2006	2,455,000	6,303,508.75	8,758,508.75	10,264,153.75	19,022,662.50
2007	2,605,000	6,148,843.75	8,753,843.75	10,274,716.25	19,028,560.00
2008	2,775,000	5,979,518.75	8,754,518.75	10,259,632.50	19,014,151.25
2009	2,955,000	5,799,143.75	8,754,143.75	8,717,856.25	17,472,000.00
2010	3,145,000	5,607,068.75	8,752,068.75	8,716,567.50	17,468,636.25
2011	3,355,000	5,402,643.75	8,757,643.75	1,035,600.00	9,793,243.75
2012	3,570,000	5,184,568.75	8,754,568.75	---	8,754,568.75
2013	3,805,000	4,952,518.75	8,757,518.75	---	8,757,518.75
2014	4,055,000	4,700,437.50	8,755,437.50	---	8,755,437.50
2015	4,325,000	4,431,793.75	8,756,793.75	---	8,756,793.75
2016	4,610,000	4,145,262.50	8,755,262.50	---	8,755,262.50
2017	4,915,000	3,839,850.00	8,754,850.00	---	8,754,850.00
2018	5,240,000	3,514,231.25	8,754,231.25	---	8,754,231.25
2019	5,590,000	3,167,081.25	8,757,081.25	---	8,757,081.25
2020	5,960,000	2,796,743.75	8,756,743.75	---	8,756,743.75
2021	6,355,000	2,401,893.75	8,756,893.75	---	8,756,893.75
2022	6,770,000	1,980,875.00	8,750,875.00	---	8,750,875.00
2023	7,220,000	1,532,362.50	8,752,362.50	---	8,752,362.50
2024	7,700,000	1,054,037.50	8,754,037.50	---	8,754,037.50
2025*	8,210,000	543,912.50	8,753,912.50	---	8,753,912.50

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*/Final Maturity

Book-Entry-Only-System

The Depository Trust Company ("DTC"), New York, NY, will act as securities depository for the Series F Bonds. The Series F Bonds will be issued as fully-registered securities registered in the name of CEDE & Co. (DTC's partnership nominee). One fully-registered Series F Bond certificate will be issued for each maturity of the Series F Bonds, each in the aggregate principal amount of such maturity, and will be deposited with DTC.

DTC is a limited-purpose trust company organized under the New York Banking Law, a "banking organization" within the meaning of the New York Banking Law, a member of the Federal Reserve System, a "clearing corporation" within the meaning of the New York Uniform Commercial Code, and a "clearing agency" registered pursuant to the provisions of Section 17A of the Securities Exchange Act of 1934. DTC holds securities that its participants ("Participants") deposit with DTC. DTC also facilitates the settlement among Participants of securities transactions, such as transfers and pledges, in deposited securities through electronic computerized book-entry changes in Participants' accounts, thereby eliminating the need for physical movement of securities certificates. Direct participants ("Direct Participants") include securities brokers and dealers, banks, trust companies, clearing corporations, and certain other organizations. DTC is owned by a number of its Direct Participants and by the New York Stock Exchange, Inc., the American Stock Exchange, Inc., and the National Association of Securities Dealers, Inc. Access to the DTC system is also available to others such as securities brokers and dealers, banks, and trust companies that clear through or maintain a custodial relationship with a Direct Participant, either directly or indirectly ("Indirect Participants"). The Rules applicable to DTC and its Participants are on file with the Securities and Exchange Commission.

Purchases of Series F Bonds under the DTC system must be made by or through Direct Participants, which will receive a credit for the Series F Bonds on DTC's records. The ownership interest of each actual purchaser of each Series F Bond ("Beneficial Owner") is in turn to be recorded on the Direct and Indirect Participants' records. Beneficial Owners will not receive written confirmation from DTC of their purchase, but Beneficial Owners are expected to receive written confirmations providing details of the transaction, as well as periodic statements of their holdings, from the Direct or Indirect Participant through which the Beneficial Owner entered into the transaction. Transfers of ownership interests in the Series F Bonds are to be accomplished by entries made on the books of

Participants acting on behalf of Beneficial Owners. Beneficial Owners will not receive certificates representing their ownership interests in Series F Bonds, except in the event that use of the book-entry system for the Series F Bonds is discontinued.

To facilitate subsequent transfers, all Series F Bonds deposited by Participants with DTC are registered in the name of DTC's partnership nominee, Cede & Co. The deposit of Series F Bonds with DTC and their registration in the name of Cede & Co. effect no change in beneficial ownership. DTC has no knowledge of the actual Beneficial Owners of the Series F Bonds. DTC's records reflect only the identity of the Direct Participants to whose accounts such Series F Bonds are credited, which may or may not be the Beneficial Owners. The Participants will remain responsible for keeping account of their holdings on behalf of their customers.

Conveyance of notices and other communications by DTC to Direct Participants, by Direct Participants to Indirect Participants, and by Direct Participants and Indirect Participants to Beneficial Owners will be governed by arrangements among them, subject to any statutory or regulatory requirements as may be in effect from time to time.

Redemption notices shall be sent to Cede & Co. If less than all of the Series F Bonds within a single maturity of an issue are being redeemed, DTC's practice is to determine by lot the amount of the interest of each Direct Participant in such issue to be redeemed.

Neither DTC nor Cede & Co. will consent or vote with respect to Series F Bonds. Under its usual procedures, DTC mails an Omnibus Proxy to the issuer as soon as possible after the record date. The Omnibus Proxy assigns Cede & Co.'s consenting or voting rights to those Direct Participants to whose accounts the Series F Bonds are credited on the record date (identified in a listing attached to the Omnibus Proxy).

Principal and interest payments on the Series F Bonds will be made to DTC. DTC's practice is to credit Direct Participants' accounts on the payable date in accordance with their respective holdings shown on DTC's records unless DTC has reason to believe that it will not receive payment on the payable date. Payments by Participants to Beneficial Owners will be governed by standing instructions and customary practices, as is the case with securities held for the accounts for customers in bearer form or registered in "street name," and will be the responsibility of such Participant and not of DTC, the Paying Agent, or the Authority, subject to any statutory or regulatory requirements as may be in effect from time to time. Payment of principal and interest to DTC is the responsibility of the Authority or the Paying Agent, disbursement of such payments to Direct Participants shall be the responsibility of DTC, and disbursement of such payments to the Beneficial Owners shall be the responsibility of Direct and Indirect Participants.

The information in this section concerning DTC and DTC's book-entry system has been obtained from sources that the Authority believes to be reliable, but none of the Authority, the Institution or the Underwriters (as hereinafter defined) take responsibility for the accuracy thereof.

Certificated Series F Bonds

DTC may discontinue providing its services as securities depository with respect to the Series F Bonds at any time by giving reasonable notice to the Authority or the Trustee. In addition, the Authority may determine that continuation of the system of book-entry transfers through DTC (or a successor securities depository) is not in the best interests of the Beneficial Owners. If for either reason the Book-Entry-Only system is discontinued, Series F Bond certificates will be delivered as described in the Agreement and the Beneficial Owner, upon registration of certificates held in the Beneficial Owner's name, will become the Bondowner. Thereafter, Series F Bonds may be exchanged for an equal aggregate principal amount of Series F Bonds in other authorized denominations and of the same maturity, upon surrender thereof at the principal corporate trust office of the Paying Agent. The transfer of any Series F Bond may be registered on the books maintained by the Paying Agent for such purpose only upon the assignment in the form satisfactory to the Paying Agent. For every exchange or registration of transfer of Series F Bonds, the Authority and the Paying Agent may make a charge sufficient to reimburse them for any tax or other governmental charge required to be paid with respect to such exchange or registration of transfer, but no other charge may be made to the Bondowner for any exchange or registration of transfer of the Series F Bonds. The Paying Agent will not be required to transfer or exchange any Series F Bond during the notice period preceding any redemption if such Series F Bond (or any part thereof) is eligible to be selected or has been selected for redemption.

Redemption Provisions

Optional Redemption of the Series F Bonds. The Series F Bonds maturing on or before July 1, 2002 are not subject to optional redemption prior to maturity. The Series F Bonds maturing after July 1, 2002 are subject to optional redemption prior to maturity, beginning on July 1, 2002. Such Series F Bonds may be redeemed by the Authority with the written consent of the Institution or at the direction of the Institution, as a whole or in part at any time, in such order of maturity as directed by the Institution, on and after July 1, 2002 at the following redemption prices expressed as percentages of their principal amount, plus accrued interest to the date fixed for redemption:

Period During Which Redeemed	Redemption Price
July 1, 2002 to June 30, 2003, inclusive	102%
July 1, 2003 to June 30, 2004, inclusive	101%
July 1, 2004 and thereafter	100%

Mandatory Redemption. In addition, the Series F Bonds maturing on July 1, 2012 and July 1, 2025 shall be redeemed prior to maturity from sinking fund installments, at their principal amounts without premium as described above under "THE SERIES F BONDS -- Description of the Series F Bonds" herein.

Special Redemption. The Series F Bonds are subject to redemption in whole or in part at any time in any order of maturity as determined by the Institution, at their principal amounts (without premium) plus accrued interest to the redemption date as provided in the Agreement, in the event that the Project or any portion thereof (including any increase or decrease in its scope consented to by the Authority) cannot be completed because of failure to obtain necessary governmental approvals on terms acceptable to the Institution (see "THE PROJECT" under the heading "Required Regulatory Approvals of the Project"), or there are excess moneys in the Construction Fund after completion of the Project, as evidenced by the filing with the Trustee of a certificate of completion, or there is damage to or destruction or taking of the Mortgaged Property which produces excess Net Proceeds (as defined in the Agreement) of insurance or condemnation awards.

Selection of Series F Bonds. Series F Bonds to be redeemed shall be selected by the Trustee by lot or in any customary manner of selection as determined by the Trustee; provided, however, that so long as DTC or its nominee is the Bondowner, if less than all of the Series F Bonds shall be called for redemption, the particular Series F Bonds or portions of Series F Bonds to be redeemed shall be selected by DTC in such manner as DTC may determine. If a Series F Bond is of a denomination in excess of five thousand dollars ($5,000), portions of the principal amount in the amount of five thousand dollars ($5,000) or any multiple thereof may be redeemed.

Acceleration. In addition to the foregoing redemption provisions, the Trustee may declare all of the Series F Bonds due and payable at par prior to maturity upon the occurrence of an Event of Default, as defined in the Agreement. See Appendix C-2 "SUMMARY OF THE AGREEMENT" under the heading "Remedies for Events of Default."

Notice of Redemption and Other Notices. So long as DTC or its nominee is the Bondowner, the Authority, the Trustee and the Paying Agent will recognize DTC or its nominee as the Bondowner for all purposes, including notices and voting. Conveyance of notices and other communications by DTC to DTC Participants, by DTC Participants to indirect Participants, and by DTC Participants and indirect Participants to Beneficial Owners will be governed by arrangements among them, subject to any statutory and regulatory requirements which may be in effect from time to time.

The Trustee shall give notice of redemption to the Bondowners not less than 30 days nor more than 45 days prior to the date fixed for redemption. Failure to mail notice to a particular Bondowner, or any defect in the notice to such Bondowner, shall not affect the redemption of any other Series F Bond. So long as DTC or its nominee is the Bondowner, any failure on the part of DTC or failure on the part of a nominee of a Beneficial Owner (having received notice from a DTC Participant or otherwise) to notify the Beneficial Owner so affected shall not affect the validity of the redemption.

Effect of Redemption. On the redemption date, the redemption price of each Series F Bond to be redeemed will become due and payable; and from and after such date, notice having been properly given and amounts having been made available and set aside for such redemption in accordance with the provisions of the Agreement, notwithstanding that any Series F Bonds called for redemption have not been surrendered, no further interest will accrue on any Series F Bonds called for redemption.

MUNICIPAL BOND INSURANCE

The following information has been furnished by Financial Guaranty for use in this Official Statement. Reference is made to Appendix E for a specimen of the Policy.

Concurrently with the issuance of the Series F Bonds, Financial Guaranty will issue the Policy for the Series F Bonds. The Policy unconditionally guarantees the payment of that portion of the principal of and interest on the Series F Bonds which has become due for payment, but shall be unpaid by reason of nonpayment by the Institution. Financial Guaranty will make such payments to Citibank, N.A., or its successor as its agent (the "Fiscal Agent"), on the later of the date on which such principal and interest is due or on the business day next following the day on which Financial Guaranty shall have received telephonic or telegraphic notice, subsequently confirmed in writing, or written notice by registered or certified mail, from an owner of the Series F Bonds or the Paying Agent of the nonpayment of such amount by the Institution. The Fiscal Agent will disburse such amount due on any Series F Bond to its owner upon receipt by the Fiscal Agent of evidence satisfactory to the Fiscal Agent of the owner's right to receive payment of the principal and interest due for payment and evidence, including any appropriate instruments of assignment, that all of such owner's rights to payment of such principal and interest shall be vested in Financial Guaranty. The term "nonpayment" in respect of a Series F Bond includes any payment of principal or interest made to an owner of a Series F Bond which has been recovered from such owner pursuant to the United States Bankruptcy Code by a trustee in bankruptcy in accordance with a final, nonappealable order of a court having competent jurisdiction.

The Policy is non-cancellable and the premium will be fully paid at the time of delivery of the Series F Bonds. The Policy covers failure to pay principal of the Series F Bonds on their respective stated maturity dates or dates on which the same shall have been duly called for mandatory sinking fund redemption, and not on any other date on which the Series F Bonds may have been otherwise called for redemption, accelerated or advanced in maturity, and covers the failure to pay an installment of interest on the stated date for its payment. Generally, in connection with its insurance of an issue of municipal securities, Financial Guaranty requires, among other things, (i) that it be granted the power to exercise any rights granted to the holders of such securities upon the occurrence of an event of default, without the consent of such holders, and that such holders may not exercise such rights without Financial Guaranty's consent, in each case so long as Financial Guaranty has not failed to comply with its payment obligations under its insurance policy; and (ii) that any amendment or supplement to or other modification of the principal legal documents be subject to Financial Guaranty's consent. The specific rights, if any, granted to Financial Guaranty in connection with its insurance of the Series F Bonds are set forth in the description of the principal legal documents appearing elsewhere in this Official Statement. Reference should be made as well to such description for a discussion of the circumstances, if any, under which the Institution is required to provide additional or substitute credit enhancement, and related matters. See APPENDIX C-2--"SUMMARY OF THE AGREEMENT" attached hereto.

This Official Statement contains a section regarding the ratings assigned to the Series F Bonds and references should be made to such section for a discussion of such ratings and the basis for their assignment to the Series F Bonds. See "RATINGS." Reference should be made to the description of the Institution for a discussion of the ratings, if any, assigned to such entity's outstanding parity debt that is not secured by credit enhancement.

Financial Guaranty is a wholly-owned subsidiary of FGIC Corporation (the "Corporation"), a Delaware holding company. The Corporation is a wholly-owned subsidiary of General Electric Capital Corporation ("GE Capital"). Neither the Corporation nor GE Capital is obligated to pay the debts of or the claims against Financial Guaranty. Financial Guaranty is a monoline financial guaranty insurer domiciled in the State of New York and subject to regulation by the State of New York Insurance Department. As of September 30, 1991, the total capital and surplus of Financial Guaranty was approximately $535,000,000. Financial Guaranty prepares financial statements on the basis of both statutory accounting principles and generally accepted accounting principles. Copies of such financial statements may be obtained by writing to Financial Guaranty at 175 Water Street, New York, New York 10038, Attention: Communications Department (telephone number: (212) 607-3000) or to the New York State Insurance Department at 160 West Broadway, 18th Floor, New York, New York 10013, Attention: Property Companies Bureau (telephone number: (212) 602-0389).

ADDITIONAL AND ALTERNATIVE INDEBTEDNESS

The Agreement permits the Institution to issue, incur, guarantee, and assume other indebtedness, and to grant security therefor, for the purposes and subject to the terms and conditions described therein. See "SUMMARY OF THE AGREEMENT" in Appendix C-2 attached hereto under the headings "Additional Bonds" and "Alternative Indebtedness." The Agreement provides that upon the occurrence of certain events permitting amendment of the agreements governing the Series D Bonds, the Series E Bonds and the Pool Loan, or the defeasance of or complete satisfaction of all obligations with respect to said agreements, the terms and conditions on which the Institution may issue, incur, guarantee, and assume other indebtedness, and grant security therefor, will be changed and, in certain instances, will become less restrictive. Such terms include, but are not limited to, one permitting the Institution to secure additional indebtedness by granting a senior lien on certain real property of the Institution and its Gross Receipts. See "SOURCES OF PAYMENT AND SECURITY FOR THE SERIES F BONDS" and Appendix C-3 - "SUMMARY OF FUTURE AMENDMENTS TO THE AGREEMENT."

RATE COVENANT

In the Agreement, the Institution agrees to use its best efforts to maintain the ratio of Net Revenues Available for Debt Service of the Institution to Total Principal and Interest Requirements for each Fiscal Year (the "Historical Debt Service Coverage Ratio") at least equal to 1.20. If the Historical Debt Service Coverage Ratio, as calculated at the end of any Fiscal Year, is less than 1.20, the Institution covenants to retain a Hospital Consultant to make recommendations as to rates and charges and other aspects of hospital management and operation. The Institution agrees to revise its rates and charges and other aspects of its management and operation in conformity with the recommendations of the Hospital Consultant or file with the Trustee its reasons for not following the recommendations. This covenant is subject to applicable legal restrictions, including those of Chapter 495 of the Acts of 1991 of the Commonwealth. See "SOURCES OF PATIENT SERVICE REVENUE" in Appendix A hereto. So long as the Institution shall retain a Hospital Consultant and the Institution shall follow such Hospital Consultant's recommendations to the extent permitted by law, the requirement to maintain the Historical Debt Service Coverage Ratio shall be deemed to have been complied with even if such ratio for any subsequent Fiscal Year is less than the required amounts, provided the ratio actually achieved is at least 1.00.

Upon amendment of the Mortgage and Trust Agreement and the First Supplemental Agreement and the consent of the credit facility for the Pool Loan, or upon defeasance of, or the complete satisfaction of all obligations with respect to, the Series D Bonds, the Series E Bonds and the Pool Loan, certain covenants applicable to the Institution effective as of the issuance of the Series F Bonds, including, but not limited to, the rate covenant described above, will be deemed revised without further action or consent by the owners of the Series F Bonds. In such an event, the Institution will thereafter be obligated to use its best efforts to maintain an Historical Debt Service Coverage Ratio at least equal to 1.10 rather than 1.20.

For a more complete description, see Appendix C-2 - "SUMMARY OF THE AGREEMENT" under the heading "Rate Covenant" and

Appendix C-3 - "SUMMARY OF FUTURE AMENDMENTS TO THE AGREEMENT" under the heading "Rate Covenant."

THE PROJECT

The Project involves (i) the construction of an eight story building of approximately 218,327 gross square feet (the "1-C North Building") to house an emergency department, an expanded operating room/day surgery suite and a variety of inpatient activities; (ii) the construction of an eight story building of approximately 158,000 gross square feet (the "1-C South Building") to house a variety of outpatient care activities; (iii) renovations to and the acquisition of capital equipment for certain of the Institution's outpatient clinic facilities; (iv) improvements to and renovation of various inpatient facilities; and (v) the acquisition of capital equipment. For a further description, see "APPENDIX A" under the heading "The Project."

Required Regulatory Approvals of the Project

A Determination of Need for the 1-C North Building has been granted by the Massachusetts Department of Public Health and the Institution has filed an Environmental Notification Form for certain portions of the Project with the Massachusetts Executive Office of Environmental Affairs ("EOEA"). The Institution will be required to complete and process an Environmental Impact Report ("EIR"). Final approval of the EIR by EOEA may be subject to conditions concerning mandatory environmental mitigation steps that must be taken in connection with the Project.

The Institution must also obtain certain other regulatory approvals and permits prior to commencement of the Project, including, but not limited to, approval by the Boston Redevelopment Agency.

The Agreement requires that all required approvals be obtained by the Institution before moneys in the Construction Fund may be applied to the payment of costs of those portions of the Project to which such approvals relate. In the event that final approval of any required permits, including the EIR, is not received, or the Institution determines that conditions imposed by the final approval of any of the permits, including the EIR, are unacceptable, any excess monies remaining in the Construction Fund must be applied either to (i) the costs of eligible substitute projects or (ii) special redemption of the Series F Bonds. See "THE SERIES F BONDS -- Redemption Provisions." Although no assurances can be given, the

Institution has no reason to believe that such approvals will not be granted.

The EIR approval and other permit approvals are applicable to the 1-C North Building and the 1-C South Building, but not to other portions of the Project. Expenditures for the 1-C North Building and the 1-C South Building, with capitalized interest and related financing costs, are expected to account in the aggregate for approximately $100,070,709 of the proceeds of the Series F Bonds. The Institution expects that if approvals for the 1-C North Building and the 1-C South Building are not obtained or are obtained on terms that are unacceptable to the Institution, it will request approval from the Authority to use the proceeds to pay for the Institution's routine capital budget for some or all of the next three fiscal years, and any amount not so used will be applied to the special redemption of the Series F Bonds. The Institution's average routine annual capital budget for the last three years has been approximately $22,600,000, but there can be no assurance that a similar level of expenditures will be made in future years. Any such approval to use proceeds of the Series F Bonds for substitute projects will be subject to limitations imposed by the Internal Revenue Code as to uses of proceeds of the Series F Bonds, including limitations with respect to the required useful life of assets financed with the proceeds of the Series F Bonds.

ESTIMATED SOURCES AND USES OF FUNDS

(excluding accrued interest from February 1, 1992)

Sources of Funds

Principal Amount of the Series F Bonds	$113,745,000	
Original Issue Discount	(1,091,163)	
Bond Proceeds		$112,653,837
Equity Contribution		28,934,844
Construction Period Earnings		9,255,193
Total Sources of Funds		$150,843,874

Uses of Funds

Costs of the Project	$124,349,301
Capitalized Interest	23,129,152
Issuance Expenses (including Underwriters' Discount of $1,018,018)	3,365,421
Total Uses of Funds	$150,843,874

BONDOWNERS' RISKS

Enforceability of Lien on Gross Receipts

The Agreement provides that the Institution shall make payments to the Authority sufficient to pay the Series F Bonds and the interest thereon as the same become due. The obligation of the Institution to make such payments is secured in part by a lien granted to the Authority by the Institution, pursuant to the Agreement, on the Gross Receipts of the Institution. Enforcement by the Authority of any right to receive directly payments under the Medicare and Medicaid programs may be subject to restrictions under federal and state statutes and regulations concerning the assignability of such claims. In addition, Gross Receipts paid by the Institution to other parties in the ordinary course of business might no longer be subject to the lien of the Agreement and might therefore be unavailable to the Authority. In the event of bankruptcy of the Institution, pursuant to the Bankruptcy Code, any receivables coming into existence and any Gross Receipts received on or after the date which is 90 days (or, in some circumstances, one year) prior to the commencement of the case in bankruptcy court might not be subject to the lien of the Authority, and under certain circumstances a court of equity may have power to direct the use of Gross Receipts to meet expenses of the Institution before paying debt service. With respect to receivables and Gross Receipts not subject to the lien, the Authority would occupy the position of an unsecured creditor. Furthermore, the lien on Gross Receipts may be released upon the occurrence of certain events. See "SOURCES OF PAYMENT AND SECURITY FOR THE SERIES F BONDS" and Appendix C-3 - "SUMMARY OF FUTURE AMENDMENTS TO THE AGREEMENT."

Enforceability of Remedies Generally

The remedies granted to the Trustee or the owners of the Series F Bonds upon an event of default under the Agreement may be dependent upon judicial actions which are often subject to discretion and delay. Under existing law, the remedies specified in the Agreement may not be readily available or may be limited. The various legal opinions to be delivered concurrently with the delivery of the Series F Bonds will be qualified as to the enforceability of the provisions of the Agreement by limitations imposed by state and federal laws, rulings and decisions affecting equitable remedies regardless of whether enforceability is sought in a proceeding at law or in equity and by bankruptcy, reorganization, insolvency, receivership or other similar laws affecting the rights of creditors generally.

Realization of Value on the Mortgaged Property

The Mortgaged Property is not comprised of general purpose buildings and would not generally be suitable for industrial or commercial use. It could be difficult to find a buyer or lessee for the Mortgaged Property if it were necessary to foreclose on the Mortgaged Property. Thus, upon any default, it may not be possible to realize the amount of the Series D, Series E, and Series F Bonds, the Pool Loan, additional Bonds and Alternative Indebtedness, if any, from a sale or lease of the Mortgaged Property.

In addition, in order to operate the Mortgaged Property as a health care facility, a purchaser of the Mortgaged Property at foreclosure sale under present law would have to obtain a Determination of Need from the Massachusetts Department of Public Health and a license for the facility.

Bondowners also should note that, under applicable federal and Massachusetts environmental statutes, in the event of any past or future releases of pollutants or contaminants on or near the Mortgaged Property, a lien superior to the Authority's lien on behalf of the Bondowners could attach to the Mortgaged Property and Gross Receipts to secure the costs of removing or otherwise treating such pollutants or contaminants. Such a lien would adversely affect the Authority's ability to realize value from disposition of the Mortgaged Property upon foreclosure. Furthermore, in determining whether to exercise any foreclosure rights with respect to the Mortgaged Property under the Agreement, the Authority would need to take into account the potential liability of any owner of the Mortgaged Property, including an owner by foreclosure, for clean-up costs with respect to such pollutants and contaminants.

The Institution has obtained a hazardous waste site assessment of a portion of the site of the 1-C North and 1-C South buildings that constitute part of the Project. The report indicates that there has been a release of hazardous materials, primarily petroleum products, at the site. The Institution expects to remove the contaminated soil at the site in connection with the construction of the Project. The Institution has obtained a waiver from the Massachusetts Department of Environmental Protection ("DEP") that will permit it to proceed with remediation of the site without extensive and time-consuming regulatory oversight. The anticipated cost of completing the remediation project in compliance with the conditions of the waiver granted by DEP is included in the cost of the Project.

The value of the security interest in Gross Receipts and the lien on Mortgaged Property could be diluted by the issuance of additional Bonds or Alternative Indebtedness secured equally and ratably with the Series D Bonds, Series E Bonds, Series F Bonds and the Pool Loan as to the liens on the Mortgaged Property and Gross Receipts. See "ADDITIONAL AND ALTERNATIVE INDEBTEDNESS." In addition, the lien on the Mortgaged Property and Gross Receipts may be released upon the occurrence of certain events. See "SOURCES OF PAYMENT AND SECURITY FOR THE SERIES F BONDS" and Appendix C-3 -- "SUMMARY OF FUTURE AMENDMENTS TO THE AGREEMENT."

Tax-Exempt Status of the Series F Bonds

The tax-exempt status of the Series F Bonds is based on the continued compliance with certain provisions of the Internal Revenue Code of 1986, as amended (the "IRC"). These covenants relate generally to arbitrage limitations, rebate of certain excess investment earnings to the federal government, restrictions on the amount of issuance costs financed with the proceeds of the Series F Bonds, the tax-exempt status of the Institution, and other use, expenditure and investment restrictions. Failure to comply with any of these provisions may result in the treatment of interest on the Series F Bonds as taxable retroactive to the date of issuance. See "TAX EXEMPTION" herein.

For a discussion of additional Bondowners' risks, see Appendix A under the headings "Bondowners' Risks and Matters Affecting the Health Care Industry" and "Sources of Patient Service Revenue."

TAX EXEMPTION

In the opinion of Palmer & Dodge, Bond Counsel to the Authority, under existing law interest on the Series F Bonds is excluded from the gross income of the owners of the Series F Bonds for federal income tax purposes. The income on the Series F Bonds, including any profit made on the sale thereof, is exempt from Massachusetts personal income taxes although the Series F Bonds and any income thereon may be included in the measure of Massachusetts estate and inheritance taxes and of certain Massachusetts corporate excise and franchise taxes.

The opinion of Bond Counsel does not cover the laws of states other than Massachusetts. Interest on the Series F Bonds may be taxable under the laws of such states.

Interest on the Series F Bonds is not an item of tax preference for purposes of the federal alternative minimum tax imposed on individuals and corporations. However, interest on the Series F Bonds will be taken into account in determining adjusted current earnings for the purpose of computing the alternative minimum tax imposed on corporations (as defined for federal income tax purposes).

The IRC established certain requirements that must be continuously satisfied subsequent to the issuance of the Series F Bonds in order for interest on the Series F Bonds to remain excluded from gross income for federal income tax purposes. Those requirements include restrictions on the use, expenditure and investment of bond proceeds and the payment of rebates, or penalties in lieu of rebates, to the United States. Failure to comply with these requirements may cause interest on the Series F Bonds to become included in the gross income of the owners thereof for federal income tax purposes retroactive to the date of issuance of the Series F Bonds. The Institution and, to the extent necessary, the Authority have covenanted to take all lawful action necessary under the IRC to ensure that interest on the Series F Bonds will remain excluded from gross income for federal income tax purposes and to refrain from taking any action which would cause interest on the Series F Bonds to become included in such gross income.

Prospective purchasers of the Series F Bonds should be aware that the IRC denies a deduction for interest on indebtedness incurred or continued to purchase or carry the Series F Bonds, or, in the case of a financial institution, for that portion of the owner's interest expense allocated to interest on the Series F Bonds and, for insurance companies subject to the tax imposed by Section 831 of the IRC, reduces the deduction for loss reserves by 15 percent of the sum of certain items, including interest on the Series F Bonds. In addition, interest on the Series F Bonds earned by certain corporations could be taken into account in determining the environmental tax imposed by Section 59A of the IRC, or the foreign branch profits tax imposed by Section 884 of the IRC, and may be included in passive investment income subject to federal income taxation under Section 1375 of the IRC applicable to certain Subchapter S corporations. The IRC also requires recipients of certain social security and railroad retirement benefits to take into account receipts and accruals of interest on the Series F Bonds in determining the portion of such benefits that are included in gross income.

For federal income tax purposes, interest includes any original issue discount on a Series F Bond allocable to the owner thereof. At maturity original issue discount is equal to the excess of the stated principal amount of the Series F Bond over the initial offering price to the public, excluding underwriters and other intermediaries, at which price a substantial amount of all Series F Bonds with the same maturity were sold. Original issue discount accrues over the term of a Series F Bond in accordance with Section 1272 of the IRC. Purchasers of Series F Bonds to be sold at an original issue discount should consult their own tax advisors with respect to the computation of interest accruing on such Series F Bonds.

On the date of delivery of the Series F Bonds, the original purchasers will be furnished with an opinion of Bond Counsel substantially in the form attached hereto as Appendix D - "PROPOSED FORM OF LEGAL OPINION."

LEGALITY OF THE SERIES F BONDS FOR INVESTMENT AND DEPOSIT

The Act provides that the Series F Bonds are securities in which all public officers and public bodies of the Commonwealth and its political subdivisions, all Massachusetts insurance companies, trust companies, savings banks, cooperative banks, banking associations, investment companies, executors, administrators, trustees and other fiduciaries may properly and legally invest funds, including capital in their control or belonging to them. The Series F Bonds, under the Act, are securities which may properly and legally be deposited with and received by any Commonwealth or municipal officer or any agency or political subdivision of the Commonwealth for any purpose for which the deposit of bonds or obligations of the Commonwealth is now or may hereafter be authorized by law.

COMMONWEALTH NOT LIABLE ON THE SERIES F BONDS

The Series F Bonds shall not be deemed to constitute a debt or liability of the Commonwealth or any political subdivision thereof, or a pledge of the faith and credit of the Commonwealth or any such political subdivision, but shall be payable solely from the Revenues derived by the Authority under the Agreement. Neither the faith and credit nor the taxing power of the Commonwealth or of any political subdivision thereof is pledged to the payment of the principal of or the interest on the Series F Bonds. The Act does not in any way create a so-called moral obligation of the Commonwealth or of any political subdivision thereof to pay debt service on the Series F Bonds in the event of default by the Institution. The Authority does not have taxing power.

UNDERWRITING

The Series F Bonds are being purchased by the firms listed on the cover hereof (collectively, the "Underwriters"), for which Kidder, Peabody & Co. Incorporated is acting as representative pursuant to a Purchase Contract between the Authority and the Underwriters. The Underwriters will purchase all of the Series F Bonds which are issued if any Series F Bonds are purchased. The obligations of the Underwriters are subject to certain terms and conditions set forth in the Purchase Contract. The Institution has agreed to indemnify the Underwriters and the Authority against certain liabilities, including certain liabilities arising under federal and state securities laws. The Underwriters may offer and sell the Series F Bonds to certain dealers (including dealers depositing Series F Bonds into unit investment trusts) and others at prices lower than the public offering prices stated on the cover page hereof. The initial offering prices may be changed from time to time by the Underwriters.

RATINGS

Fitch Investors Service, Inc., Moody's Investors Service, Inc. and Standard & Poor's Corporation have assigned ratings of "AAA," "Aaa" and "AAA," respectively, to the Series F Bonds, with the understanding that, upon delivery of the Series F Bonds, the Policy will be issued by Financial Guaranty. Such ratings reflect only the views of such organizations and any desired explanation of the significance of such ratings should be obtained from the rating agency furnishing the same, at the following addresses: Fitch Investors Service, Inc., One State Street Plaza, New York, New York 10004; Moody's Investors Service, Inc., 99 Church Street, New York, New York 10007; and Standard & Poor's Corporation, 25 Broadway, New York, New York 10004. Generally, a rating agency bases its rating on the information and materials furnished to it and on investigations, studies and assumptions of its own. There is no assurance such ratings will continue for any given period of time or that such ratings will not be revised downward or withdrawn entirely by the rating agencies, if in the judgment of such rating agencies, circumstances so warrant. Any such downward revision or withdrawal of such ratings may have an adverse effect on the market price of the Series F Bonds.

LEGAL MATTERS

All legal matters incidental to the authorization and issuance of the Series F Bonds by the Authority are subject to the approval of Palmer & Dodge, Boston, Massachusetts, Bond Counsel, whose opinion approving the validity and tax exempt status of the Series F Bonds will be delivered with the Series F Bonds. A copy of the proposed form of the opinion of Bond Counsel is attached hereto as Appendix D. Certain legal matters will be passed on for the Institution by its counsel, Ropes & Gray, Boston, Massachusetts. Certain legal matters will be passed on for the Underwriters by their counsel, Choate, Hall & Stewart, Boston, Massachusetts.

There is not now pending any litigation restraining or enjoining the issuance or delivery of the Series F Bonds or questioning or affecting the validity of the Series F Bonds or the proceedings and authority under which they are to be issued. Neither the creation, organization, or existence of the Authority, nor the title of the present members or other officers of the Authority to their respective offices is being contested. See Appendix A with respect to any material litigation affecting the Institution.

MISCELLANEOUS

The references to the Act and the Agreement are brief summaries of certain provisions thereof. Such summaries do not purport to be complete, and reference is made to the Act and the Agreement for full and complete statements of such provisions. The agreements of the Authority with the holders of the Series F Bonds are fully set forth in the Agreement, and neither any advertisement of the Series F Bonds nor this Official Statement is to be construed as constituting an agreement with the Bondowners. So far as any statements are made in this Official Statement involving matters of opinion, whether or not expressly so stated, they are intended merely as such and not as representations of fact. Copies of the documents mentioned in this paragraph are on file at the offices of the Authority and of the Trustee.

Information relating to DTC and the book-entry system described herein under the heading "THE SERIES F BONDS -- Book-Entry-Only System" has been furnished by DTC and is believed to be reliable, but none of the Authority, the Institution or the Underwriters make any representations or warranties whatsoever with respect to such information.

Attached hereto as Appendix A is a letter from the Institution to the Authority which contains certain information relating to Institution and the Project. While the information contained therein is believed to be reliable, the Authority and the Underwriters make no representations or warranties whatsoever with respect to the information contained therein.

Attached hereto as Appendix B are the audited financial statements of the Institution and the report of its independent certified public accountants.

Appendix C-1 - DEFINITIONS OF CERTAIN TERMS, Appendix C-2 - SUMMARY OF THE AGREEMENT and Appendix C-3 - SUMMARY OF FUTURE AMENDMENTS TO THE AGREEMENT have been prepared by Palmer & Dodge, Bond Counsel to the Authority. The proposed form of legal opinion contained in Appendix D has been prepared by Palmer & Dodge, Bond Counsel. Appendix E--"SPECIMEN OF MUNICIPAL BOND INSURANCE POLICY" has been prepared by Financial Guaranty.

The Institution has reviewed the portions of this Official Statement describing the Institution, the Project, Estimated Sources and Uses of Funds, and Bondowners' Risks, has furnished Appendix A to this Official Statement, and has approved all such information for use with this Official Statement. At the closing, the Institution will certify that such portions of this Official Statement, except for any projections and opinions contained in such portions, do not contain an untrue statement of a material fact or omit to state a material fact necessary in order to make the statements made therein, in the light of the circumstances under which they are made, not misleading.

The execution and delivery of this Official Statement by its Executive Director has been duly authorized by the Authority.

MASSACHUSETTS HEALTH AND
EDUCATIONAL FACILITIES AUTHORITY

By:/s/ Edward M. Murphy
Executive Director

NEW ENGLAND MEDICAL CENTER HOSPITALS, INC.

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Appendix A

New England
Medical Center Hospitals

Jerome H. Grossman, M.D.
President

1796 Boston Dispensary
1894 Floating Hospital for Infants and Children
1938 Pratt Diagnostic Clinic
1948 New England Center Hospital
1958 Rehabilitation Institute

The principal teaching hospitals for Tufts University School of Medicine

750 Washington Street
Boston, Massachusetts 02111
Telephone: (617) 956-5000

February 13, 1992

Massachusetts Health and Educational
Facilities Authority
99 Summer Street, Suite 1000
Boston, Massachusetts 02110

Dear Members of the Authority:

In connection with the issuance by the Massachusetts Health and Educational Facilities Authority of its Revenue Bonds, New England Medical Center Hospitals Issue, Series F (the "Bonds"), we are pleased to submit the following information regarding New England Medical Center Hospitals, Inc. for inclusion in the Official Statement of the Authority. As used hereinafter and unless otherwise indicated by the context, all utilization and financial data for any year refer to the fiscal year ending on the last Saturday in September.

HISTORY AND ORGANIZATION

New England Medical Center Hospitals, Inc. ("NEMCH" or the "Hospital") is a not-for-profit, tertiary referral, teaching, and research hospital with a licensed capacity of 488 beds. The Hospital is located in downtown Boston adjacent to the Tufts University Schools of Medicine and Dentistry, for which it serves as a primary teaching affiliate. Most of the Boston downtown area lies within a one-mile radius of NEMCH. Two major expressways and two rapid transit lines are located within one quarter mile of the Hospital, and a rapid transit station is located across the street, from the Hospital's main entrance.

The Hospital dates from 1796 when the Boston Dispensary was founded "for the purpose of affording medical advice and relief to the sick poor." It was the third health care facility in the United States and the first in New England. In 1894, the Boston Floating Hospital was founded to care for "sick babies", and for many years its operations were conducted aboard a hospital ship in Boston harbor. A third unit was incorporated in 1946 and renamed in 1948 as New England Center Hospital. In 1965, these three hospitals were consolidated into one corporation now named New England Medical Center Hospitals, Inc.

In 1983, a new not-for-profit corporation, New England Medical Center, Inc. (the "Parent Corporation"), became the sole corporate member of NEMCH. The Parent Corporation provides overall coordination and direction of the activities conducted by its affiliates and subsidiaries. See "AFFILIATED CORPORATIONS."

In recent years, the Hospital has extensively replaced and renovated its facilities. In 1982, it opened a new Boston Floating Hospital facility, housing all of its pediatric beds, as well as new laboratories and new operating rooms. From 1983 through 1986, it completed renovations to the buildings housing all ambulatory services, created expanded space for inpatient care, consolidated critical care and supporting ancillary services, and constructed a suite dedicated to ambulatory surgery. In 1986, the Hospital opened a research facility of approximately 110,000 square feet, and in 1989 it completed renovations to another existing research building.

Beginning in 1988, the Hospital also has focused greater attention on the provision of primary care outpatient services. This focus is consistent with the Hospital's managed care contracts, many of which include the provision of primary care to subscribers (See "ALTERNATIVE DELIVERY SYSTEMS"); NEMCH's convenient location for members of health maintenance organizations and other individuals who are employed in the downtown area; and its status as the community hospital for portions of Boston, particularly Chinatown. Demand for primary care services has consistently grown, and management believes that growth in such services will be necessary to increase referrals for secondary and tertiary services and will be a significant factor in maintaining market share.

HOSPITAL SERVICES

Inpatient Services

The Hospital is currently licensed by the Massachusetts Department of Public Health (the "Department of Public Health") to operate 488 beds; upon completion of the Project, and the addition of certain approved beds in the interim the Hospital expects to be licensed to operate 597 beds. The current and expected bed configurations are as follows:

		Licensed Beds:	
Service		At Present	Upon Project Completion
Adult:	Medical/Surgical	301	317
	Medical/Surgical Intensive Care	44	64
		345	381
Pediatric:	Medical/Surgical	64	68
	Pediatric Intensive Care	10	25
	Neonatal Intensive Care	28	40
		102	133
Psychiatry:	Adult	25	25
	Pediatric	10	10
		35	35
Obstetrics:		0	42
Clinical Study Unit (research):		6	6
TOTAL		488	597

The Hospital currently provides care in all major specialties except obstetrics, and, as described below, expects to open an obstetrics service in July 1992. The current departments of the Hospital and the divisions within each department are as follows:

- Anesthesiology
- Dentistry
- Dermatology
- Medicine including:
  - Allergy
  - Cardiology
  - Clinical Decision Making
  - Endocrinology
  - Gastroenterology
  - General Internal Medicine
  - Geographic Medicine
  - Hematology-Oncology
  - Infectious Disease
  - Molecular Medicine
  - Nephrology
  - Pulmonary
  - Rheumatology
- Neurology
- Neurosurgery
- Obstetrics/Gynecology
- Ophthalmology
- Orthopedic Surgery
- Otolaryngology
- Pathology
- Pediatrics including:
  - Arthritis and Rheumatic Disease
  - Birth Defects/Genetic Counseling
  - Cardiology
  - Endocrinology
  - Gastroenterology/Nutrition
  - General Pediatrics
  - Hematology/Oncology
  - Infectious Disease
  - Neonatology
  - Pediatric Nephrology
  - Neurology
  - Pulmonary/Allergy
- Psychiatry including:
  - Adult Psychiatry
  - Child Psychiatry
  - Clinical Pharmacology
- Radiation Oncology
- Radiology including:
  - Angiography and Interventional
  - Computerized Tomography ("CT")
    - Body Scanning
  - Magnetic Resonance Imaging
  - Neuroradiology
  - Nuclear Medicine
  - Pediatric Radiology
  - Ultrasound
- Rehabilitation Medicine
- Surgery including:
  - Cardiothoracic
  - Gastrointestinal
  - Oncology
  - Pediatric
  - Pediatric Trauma
  - Plastic
  - Transplantation
  - Vascular
- Urology

The Hospital's primary focus is the provision of tertiary care patient services, with secondary emphasis on the provision of primary and other patient care services, the conduct of research and the teaching and training of medical students and graduate physicians.

Indicative of its tertiary care patient services is its Medicare case mix intensity, a measure of the severity of illness, which in 1990 was the third highest among eight Boston teaching hospitals as reported by the Massachusetts Health Data Consortium. Also indicative, management believes, is the relatively wide geographic area from which the Hospital draws its patients. In 1990, approximately 27.5% of NEMCH's total discharges were from the City of Boston, 22.3% were residents of the Greater Boston Metropolitan Area (Health Services Area ("HSA") IV, as defined by the Department of Public Health), 37.3% were from other Eastern Massachusetts HSAs (essentially, the part of the state that is east of the Worcester Metropolitan Area), and 12.9% were from the rest of Massachusetts or other states.

Pediatric discharges draw from an even wider area. In 1990, approximately 13.0% of NEMCH's pediatric discharges were from the City of Boston, 20.9% were from the remainder of HSA IV, 49.6% were from other Eastern Massachusetts HSAs and 16.4% were from the rest of Massachusetts and other states. Management believes that NEMCH's patient base is diverse in part because it is a primary clinical affiliate of Tufts University School of Medicine (the "Medical School"); and although other hospitals affiliated with the Medical School offer tertiary care services, the number and type of tertiary services NEMCH provides are greater than are available in any other such affiliated hospital. Many of the community physicians who refer patients to NEMCH are Medical School graduates or served their internships or residencies at NEMCH.

Selected specialized adult and pediatric clinical services provided at the Hospital are described below:

Transplantation. In 1991 the Hospital performed 29 liver transplants, 5 heart transplants, 31 bone marrow transplants and 21 kidney transplants. NEMCH is a member of four collaborative transplantation programs. The Boston Center for Liver Transplantation consists of NEMCH, Children's Hospital, Massachusetts General Hospital, New England Deaconess Hospital, and University Hospital. The Boston Center for Heart Transplantation consists of NEMCH, Children's Hospital, Massachusetts General Hospital, and Brigham and Women's Hospital. Two other collaborative programs - the Massachusetts Center for Lung Transplantation and the Massachusetts Center for Pancreas Transplantation - have been more recently established; NEMCH is a member of both programs but has not yet performed transplants in either category. All of these programs provide for joint screening of transplantation candidates, establishment of uniform treatment protocols, granting of clinical privileges by each hospital to participating physicians from each other hospital, dissemination of research results, and establishment of joint training programs.

Neonatology. The Boston Floating Hospital building includes a 28-bed neonatal intensive care unit ("NICU") within its 106 pediatric beds. Neonatal activity has increased in recent years as a result of advances in the treatment of severely premature infants. Collaborative programs have also been established with four community hospitals in the Boston area, through which NEMCH and community physicians work together so that neonatal patients requiring special care can be transferred to the community hospital near their home when they no longer require NICU services but must remain in an acute care setting.

Pediatric Hematology/Oncology. The volume of admissions and clinic visits for NEMCH pediatric hematology/oncology patients has increased substantially in recent years. The 537 discharges for 1991 represent a growth of approximately 200% since 1986. The treatment of pediatric leukemia, in particular, has increased in its complexity, and most community hospitals are now referring these patients to tertiary care institutions such as NEMCH.

Center for Children with Special Needs. This multi-disciplinary outpatient treatment center for children with congenital, neurological problems was established in 1990. Clinicians in neurology, otolaryngology, neuropsychiatry, physical and speech therapy collaborate on all aspects of the child's treatment. During the Center's first full year of operation in 1991, 2,619 patients were treated.

Critical Care Transport. The Hospital was a founder of Boston MedFlight, a critical care helicopter service shared by NEMCH and seven other Boston hospitals. The specially equipped and staffed medical rescue helicopter transports critically ill or injured patients from throughout the New England area to its sponsor hospitals. As of September 1991, approximately 660 patients had been transported to the Hospital by Boston MedFlight since the inception of the program in 1985, including 159 patients transported in 1991.

Pediatric Trauma. In 1981, the Hospital opened the Kiwanis Pediatric Trauma Institute ("KTI"), which was one of the first regional trauma centers in the nation devoted exclusively to pediatric care. Kiwanis Foundation of New England, the philanthropic arm of the New England District of Kiwanis International, has been funding KTI in recent years by contributions of approximately $250,000 annually. In 1991, approximately 70 pediatric trauma patients were treated at the Hospital.

Pediatric Rheumatology. NEMCH is the coordinating center of the Affiliated Children's Arthritis Centers of New England. This network of 12 hospitals in New England was founded in 1984 to improve the quality of health care for children with rheumatic diseases.

Breast Health Center. This facility was established in 1983 as one of the first multi-disciplinary diagnosis and treatment centers to be established for breast cancer patients. Physicians in medical oncology, surgical oncology and radiation therapy see patients together and collaborate on their cases. Approximately 4,955 clinic visits took place at the Center in 1991, a 4.2% increase over 1990.

Ophthalmology. In September 1991, NEMCH established the New England Eye Center, which will serve as a tertiary referral center for eye disorders and which will focus particularly on the use of lasers in eye treatment. A new facility for the Eye Center will be constructed in 1992 as part of the renovation of the Biewend Ambulatory Care Center and will be financed from a portion of the proceeds of the Series F Bonds. (See "THE PROJECT.")

Stem Cell Transplantation. NEMCH is one of the few hospitals in the nation performing this procedure, which is used to treat cancer patients for whom traditional bone marrow transplantation is no longer possible. Stem cells are withdrawn from the bloodstream, preserved, and then returned to the patient following chemotherapy.

Cardiac Arrhythmia Treatment. NEMCH is one of only a few hospitals nationally using radio frequency to treat ventricular fibrillation, a common form of cardiac arrhythmia which causes over 700,000 deaths annually in the United States.

Obstetrics. In July of 1992, the Hospital is scheduled to establish a 16-bed maternity service on the second floor of the Proger Building. The service, with an initial capacity of approximately 1,500-1,800 deliveries annually, will include antenatal testing to diagnose fetal abnormalities and will include accommodations for antepartum care for high risk mothers. The Department of Obstetrics/Gynecology will add a new Division of Maternal Fetal Medicine to provide prenatal care and to monitor high risk pregnancies. Upon completion of the 1-C North Building (see "THE PROJECT"), the maternity service will be expanded to 42 beds.

With the opening of the obstetrical service, for the first time NEMCH will provide the full range of medical and surgical services on its campus. This will improve continuity of care among the obstetric, neonatal and pediatric services. Historically, obstetric services rendered by NEMCH medical staff members have been provided at St. Margaret's Hospital for Women ("St. Margaret's"), a 118-bed obstetric/gynecological hospital in Dorchester, a Boston neighborhood located approximately two miles from NEMCH. St. Margaret's has been the site of the Medical School's obstetrics training program and has been staffed, in part, by NEMCH obstetrician/gynecologists. St. Margaret's had approximately 2,658 discharges in 1990. St. Margaret's has announced its intention to close its existing facility in 1993 and to transfer 45 of its existing 69 obstetrical beds and 30 of its 35 neonatal intensive care beds to St. Elizabeth's Hospital of Boston, approximately ten miles away in the Brighton neighborhood of Boston. St. Elizabeth's is expected to close its 18 obstetrical beds in conjunction with the relocation of St. Margaret's.

NEMCH management anticipates that the ten NEMCH obstetricians currently performing deliveries at St. Margaret's will move their practices to the new NEMCH obstetrics unit. In addition, because NEMCH is the principal provider of tertiary care services to members of the Tufts Associated Health Plan (See "ALTERNATIVE DELIVERY SYSTEMS"), management believes that most of the high risk obstetrical patients who formerly would have been referred to St. Margaret's will be referred to NEMCH following the opening of the new unit. Management further believes that many women with high-risk pregnancies who reside in Dorchester will continue to deliver their babies in the geographically closest facility, particularly when they are patients of NEMCH obstetricians.

Ambulatory and Outpatient Services

The Hospital's ambulatory services include an emergency department, a Day Surgery Center, outpatient clinics for general medicine, surgery, pediatrics, gynecology, mental health, and 10 medical subspecialties. Since virtually all full-time NEMCH physicians are salaried members of physician groups related to the Hospital, these physicians conduct most of their outpatient activity at the Hospital rather than in separate private offices. See "HOSPITAL MANAGEMENT AND PERSONNEL: Medical Staff." This system has helped ensure a steady volume of outpatient activity at the Hospital. Additional information concerning outpatient activity is included under "UTILIZATION."

The Hospital is undertaking a major effort to upgrade and expand its outpatient facilities between now and 1996. The 1-C North Building will include a new emergency room (replacing and consolidating the adult and pediatric emergency treatment facilities) and new day surgery facilities. The 1-C South Building will include approximately 150,000 gross square feet of new outpatient space. The existing Biewend Ambulatory Care Center will also be extensively renovated. The majority of these expenditures will be financed from a portion of the proceeds of the Series F Bonds. (See "THE PROJECT.")

RESEARCH

NEMCH has consistently engaged in a large and diverse program of medical research. In 1991, the Hospital received the sixth largest share of hospital-based research funds awarded by the National Institutes of Health ("NIH"). Hospital management is committed to the further expansion of research activities and believes these activities to be crucial to the recruitment of talented academic physicians and scientists to the Hospital. The amount of future research support will depend in large part on future federal government funding policies for research grants. Research funds are also provided by private industry; approximately $1 million in such funds were received in 1991. (See "REIMBURSEMENT FOR RESEARCH.") The Hospital has been notified that it will be audited with respect to its research activities supported with federal funds. Management of the Hospital believes that it has taken adequate reserves with respect to any claim likely to arise as a result of such audit.

The following table sets forth for each of the last five years the direct research expense, overhead recovery and total funding for research. As the table indicates, the substantial majority of increased funding for research has represented grants to The Health Institute, described below.

Year	Direct Expense	Overhead Recovery	Total Funding	Direct Expenses Provided to The Health Institute
		(in thousands of dollars)		
1987	$15,527	$ 4,148	$19,675	$ 0
1988	19,947	6,712	26,659	0
1989	21,002	5,770	26,772	612
1990	21,359	7,129	28,488	1,727
1991	23,005	5,778	28,783	3,935

Source: Hospital records.

Major current research programs include the following:

AIDS research: In 1988, NEMCH was awarded a four-year $2 million grant to study AIDS-associated diarrhea and Wasting Syndrome in Africa. The project includes funding for a microbiology laboratory, a clinical study unit for the hospitalization of patients, a gastrointestinal study facility, and a biostatistics and data management unit.

Blood coagulation: NEMCH has received a 5 year approximately $8 million grant to support research on cells and proteins involved in blood coagulation. The grant will fund basic research on the synthesis, structure and function of membrane proteins crucial to blood coagulation and hemostasis (cessation of bleeding).

Brain tumors: NEMCH and Massachusetts Institute of Technology ("MIT") researchers have been awarded a 3 year $1.8 million grant from the United States Department of Energy for clinical trials of an experimental treatment called Neutron Capture Therapy. The treatment uses high-energy short-range nuclear particles to destroy brain tumors with minimal harm to surrounding healthy tissue. Other NEMCH researchers are developing a treatment whereby ultrasound radiation is used to focus heat on malignant tumors while avoiding nearby healthy tissue.

Cancer research: NEMCH researchers have developed a method which may lead to earlier detection and treatment of T-cell leukemia. NEMCH physicians are also studying the viruses which cause cervical warts and the mechanism by which such warts can become cancerous.

Clinical decision making: A research team at NEMCH has been investigating the use of computerized logical decision analysis in medical decision making. NEMCH and MIT researchers are now heading a study to investigate the use of artificial intelligence techniques for these purposes.

Heart disease: NEMCH researchers are working to develop new materials to be used in synthetic replacements for damaged arteries, since existing materials are relatively ineffective when the damaged artery is small.

Neurology: NEMCH researchers have developed a technique, using high-resolution video cameras and computer imaging, which records detailed color images of electrical activity in the brain. This technique may have important implications in the diagnosis and treatment of Alzheimer's disease, epilepsy, brain tumors, and degenerative neuromuscular disorders. NEMCH researchers have also developed a procedure which uses magnetic resonance imaging technology and a complex computer program to develop more precise images of brain tissue.

The Health Institute ("THI") - patient outcomes research: THI was founded in 1988 as a part of the Hospital. In 1990, THI received a 5 year $17 million grant from the Kaiser Family Foundation to train researchers and develop a comprehensive research program to measure patient outcomes and to determine the factors - both medical and social - that contribute to these outcomes. Much of the research and training at THI is done in collaboration with the Harvard School of Public Health and other health care, research and educational institutions.

Other patient outcome studies: NEMCH has been awarded approximately $9 million in NIH grants over a five year period for two major studies of patient outcomes, which studies are administered by THI. In one study, researchers will develop a comprehensive database to monitor costs, quality and outcomes of care for patients with Type II Adult Diabetes in three large health care delivery organizations. In the other study, researchers are developing strategies to enable children and their parents to play a more active role in pediatric health care.

Other research: Other subjects of current research include the causes of Sudden Infant Death Syndrome, the effects of diet on kidney function, the causes and prevention of childhood injuries, and the effectiveness of anti-bacterial drugs in treating cystic fibrosis.

CLINICAL AND EDUCATIONAL AFFILIATIONS

NEMCH is a primary clinical affiliate of Tufts University School of Medicine. A majority of all students at the Medical School receive undergraduate training at the Hospital. The Medical School's approximately 5,000 graduates who currently practice medicine, most of them in New England, provide an important source of referrals to NEMCH. The Chief of each clinical service at the Hospital also serves as the Chairman of the corresponding academic department at the Medical School. The Department Chief/Academic Chairman is responsible for the coordination and supervision of the academic programs at the 15 other institutions to which Tufts University sends its third and fourth year medical students and which are known as the Tufts Affiliated Hospitals: AtlantiCare Medical Center, Lynn; Baystate Medical Center, Springfield; Boston City Hospital; Boston Veterans Administration Medical Center; Cardinal Cushing Hospital, Brockton; Faulkner Hospital, Boston; Lemuel Shattuck Hospital, Boston; Maine Medical Center, Portland, Maine; New England Baptist Hospital, Boston; Newton-Wellesley Hospital, Newton; North Shore Children's Hospital, Salem; St. Anne's Hospital, Fall River; St. Elizabeth's Hospital, Boston; St. Margaret's Hospital, Boston; and Winchester Hospital, Winchester. NEMCH is also a member of VHA Healthfront, Inc., a coalition of approximately 21 hospitals in the region.

NEMCH administers programs for approximately 480 residents, interns, and fellows (including research fellows) in the following 33 specialties and subspecialties:

Adult psychiatry
Anesthesiology
Cardiology
Cardiothoracic surgery
Child psychiatry
Dermatology
Diagnostic radiology
Endocrinology
Gastroenterology
Gynecology and obstetrics
Hematology/oncology
Infectious diseases
Medicine
Neonatal/perinatal medicine
Nephrology
Neurology
Neuropathology
Ophthalmology
Orthopedics
Otolaryngology
Pathology
Pediatrics
Pediatric neurology
Pediatric surgery
Physical and rehabilitation medicine
Radiation oncology
Pulmonary medicine
Neuroradiology
Neurosurgery
Rheumatology
Surgery
Vascular Surgery
Urology

NEMCH provides the clinical training site for approximately 400-500 nursing students at the undergraduate and graduate levels each year. The Hospital has ongoing arrangements for training nursing students in cooperation with Boston College, Laboure College, Lawrence Memorial Hospital School of Nursing, Northeastern University, Quincy Junior College, Salem State College, Simmons College, University of Massachusetts at Lowell, and University of Massachusetts at Boston.

ALTERNATIVE DELIVERY SYSTEMS

NEMCH currently contracts with managed care plans in two different ways: as a tertiary care provider and, through its medical staff, as a primary care provider. Managed care patients comprised 24% of the hospital's admissions in 1991. NEMCH management believes that expansion of its primary care relationships with managed care payors will constitute an important factor in increasing demand for the Hospital's inpatient and outpatient services over the next five years.

In 1981, NEMCH was primarily responsible for organizing an Independent Practice Association ("IPA") model health maintenance organization ("HMO") known as Tufts Associated Health Plan ("TAHP"). As of October 1991, TAHP had 149,000 members and was the fourth largest HMO in Massachusetts. The NEMC IPA, Inc., a non-profit corporation controlled by members of NEMCH's medical staff, is the largest IPA in the TAHP network with 1300 members. TAHP contracts with the NEMC IPA to provide primary care services at NEMCH. Its members account for five percent of the Hospital's admissions. The Hospital also has a contract to provide tertiary services to members from the TAHP network; these members account for another 4% of Hospital admissions.

The Hospital and its Medical Staff have also entered into agreements to provide primary and tertiary care to enrollees of an HMO operated by Blue Cross and Blue Shield of Massachusetts, Inc., known as HMO Blue, and to enrollees of Pilgrim Healthcare, Inc. ("Pilgrim") and Baystate Healthcare ("Baystate"). Baystate referrals accounted for 5% of the Hospital's admissions, while HMOs other than TAHP accounted for a smaller number of admissions. The Hospital has contracted with a number of other managed care providers, including the following HMOs: Baystate, CIGNA Health Plan, Fallon Community Health Plan, Inc., Blue Cross and Blue Shield of Massachusetts, Inc. (Medical East and HMO Blue Plans), Harvard Community Health Plan, Healthsource Maine, Inc., Matthew Thornton Health Plan, Neighborhood Health Plan, Inc. and Ocean State Physician's Health Plan. The Hospital has also contracted with a number of PPOs, including: Affordable HealthCare Concepts, Healthcare VALUE Management, Inc., John Hancock Mutual Life Insurance Company, Medical Expense Deposit Trust Administration and Coordination Inc. ("MED-TAC"), Options for Healthcare, Private Healthcare Systems, Ltd., Multi-Group Health Plan, Aetna, and Travelers Insurance Company.

COMPETITION

There are eight major teaching hospitals in Boston that the Hospital views as providing similar services: Beth Israel Hospital, Boston City Hospital, Brigham and Women's Hospital, Children Hospital Medical Center (providing pediatric services only), Massachusetts General Hospital, New England Deaconess Hospital, St. Elizabeth's Hospital and University Hospital. All of these institutions are located in the City of Boston, provide tertiary care to patients from a wide service area, conduct significant research activity, and educate students from the medical schools with which they are affiliated. Three of these hospitals, Massachusetts General Hospital, Boston City Hospital and Children's Hospital Medical Center, offer inpatient pediatric services. Beth Israel Hospital, Boston City Hospital, Brigham and Women's Hospital and St. Elizabeth's Hospital offer obstetrical services, and Massachusetts General Hospital has announced its intention to start an obstetrical service in 1994. Beth Israel Hospital, Massachusetts General Hospital, New England Deaconess Hospital, and St. Elizabeth's Hospital offer psychiatric services.

NEMCH also competes with community facilities in the Greater Boston area, some of which are teaching institutions, and with specialty hospitals that compete with one or more of the Hospital's services.

Summarized below are selected utilization statistics for NEMCH and the eight other major Boston teaching hospitals over the four years ending in 1991, together with the medical school affiliation of each Hospital in parenthesis.

		Average Available Beds	Admissions	Average Patient Days	Length of Stay	Occupancy Percentage	Emergency Visits	Hospital Based Clinic Visits
.and Medical Center	1988	448	15,798	141,743	8.97	87.3	27,347	242,784
al (Tufts University)	1989(3)	451	16,821	145,780	8.67	87.1	27,373	269,799
	1990	460	16,747	143,440	8.57	85.4	26,864	271,738
	1991	460	17,152	141,543	8.25	84.7	27,061	284,080
ease/(decrease) 1991 vs 1988		2.7%	8.6%	(0.1%)	(8.0%)	(3.0%)	(1.0%)	17.0%
rael Hospital (2)	1988	460	27,553	152,730	5.54*	90.0	55,624	136,526
rd University)	1989(3)	504	29,802	159,840	5.36	87.0	54,795	146,299
	1990	504	29,027	171,161	5.90	93.0	53,257	149,365
	1991	502	28,362	166,143	5.86	90.7	53,966	160,232
ease/(decrease) 1991 vs 1988		9.1%	2.9%	8.8%	5.8%	0.8%	(3.0%)	17.4%
City Hospital	1988	334	15,624	103,875	6.65*	76.0	65,144	134,481
n University)	1989	335	14,911	103,673	6.95	80.0	59,333	135,896
	1990	367	15,232	100,527	6.60	73.2	63,309	156,492
	1991	367	15,675	93,453	5.96	74.4	55,658	152,794
ease/(decrease) 1991 vs 1988		9.9%	0.3%	(10.0%)	(10.4%)	(2.1%)	(14.6%)	13.6%
& Women's Hospital	1988	713	35,136	233,624	6.65	88.7	44,511	245,810
rd University)	1989	713	35,015	255,155	7.29	85.7	45,241	268,472
	1990	720	36,952	233,466	6.32	85.0	45,886	275,405
	1991	720	37,712	221,238	5.87	84.2	46,285	317,695
ease/(decrease) 1991 vs 1988		1.0%	7.3%	(5.3%)	(11.7%)	(5.1%)	4.0%	29.2%
n's Hospital	1988	346	13,766	92,566	6.72	76.0	49,725	162,601
	1989	346	15,002	99,812	6.65	81.7	48,284	176,191
	1990	346	15,995	101,844	6.37	81.5	48,141	185,144
	1991	346	16,373	101,119	6.18	80.1	50,585	201,222
ease/(decrease) 1991 vs 1988		0.0%	18.9%	9.2%	(8.0%)	5.4%	1.7%	23.8%
husetts General Hospital	1988	969	33,260	310,738	9.34	87.7	79,166	316,467
ard University)	1989	993	33,673	303,069	9.00	83.6	75,022	325,679
	1990	998	35,019	303,176	8.66	83.2	86,625	379,698
	1991	1,010	35,838	303,207	8.46	82.2	83,843	519,339
ease/(decrease) 1991 vs 1988		4.2%	7.8%	(2.4%)	(9.4%)	(6.3%)	5.9%	64.1%
gland Deaconess Hospital	1988	420	13,743	129,924	9.45	87.3	6,169	32,630
ard University)	1989	369	13,710	121,056	8.83	83.5	6,191	38,266
	1990(1)	392	13,400	114,732	8.56	81.9	5,863	33,081
	1991	431	12,847	103,118	8.03	65.5	3,718	32,351
rease/(decrease) 1991 vs 1988		2.6%	(6.5%)	(20.6%)	(15.0%)	(25.0%)	(39.7%)	(0.9%)
izabeth's Hospital	1988	350	12,603	104,125	8.26	81.0	40,466	105,864
	1989	350	13,621	111,279	8.17	87.3	38,713	106,794
	1990	350	14,594	114,998	7.88	88.7	36,965	133,420
	1991	356	14,535	115,047	7.92	88.5	36,775	123,882
rease/(decrease) 1991 vs 1988		1.7%	15.3%	10.5%	(4.1%)	9.3%	(9.1%)	17.0%
sity Hospital	1988	379	10,415	111,640	10.72	80.7	15,606	67,523
on University)	1989(3)	379	10,605	103,392	9.75	73.5	14,805	76,112
	1990	328	10,782	92,792	8.61	77.5	14,177	77,398
	1991	328	10,648	89,330	8.39	74.6	15,123	78,468
rease/(decrease) 1991 vs 1988		(13.5%)	2.2%	(20.0%)	(21.7%)	(7.6%)	(3.1%)	16.2%

: Information submitted to the Massachusetts Health and Educational Facilities Authority, Massachusetts Rate Setting sion, and Boston Organization of Teaching Hospital Financial Officers

r length of stay reflects short obstetric stays.

dicates 371-day year due to change in fiscal year to 12 one-month periods.

cludes newborn activity.

dicates a 53-week year.

UTILIZATION

A summary of significant statistical data for the Hospital for the five years ended September 28, 1991 and the eight week periods ending November 24, 1990 and November 23, 1991 is presented in the following table. The data do not include the Hospital's Clinical Study Unit, a six-bed unit used for research purposes. The Hospital's inpatient rehabilitation services were discontinued as of June 16, 1989, and its outpatient rehabilitation services were transferred to a physician group practice as of October 1, 1989. The year ended September 30, 1989 is a 53-week period; all other years are 52-week periods.

	1987	1988	1989	1990	1991	Eight weeks ended November 24, 1990	November 23, 1991
ENT STATISTICS							
e Beds in Use							
Medical/Surgical	286	289	308	323	324	324	322
Psychiatry/ bilitation*	45	45	35	21	20	20	20
ric (including Psych.)	112	112	115	116	116	116	116
Total	443	446	458	460	460	460	458
sions							
Medical/Surgical	10,611	11,527	12,291	12,312	12,502	1,902	1,934
Psychiatry/ abilitation*	569	525	422	351	358	53	56
tric (including Psych.)	3,690	3,746	4,108	4,084	4,292	645	675
Total	14,870	15,798	16,821	16,747	17,152	2,600	2,665
nt Days							
Medical/Surgical	96,315	95,923	102,716	104,035	105,022	16,030	16,443
Psychiatry/ abilitation*	12,924	12,465	9,182	6,143	5,666	900	818
tric (including Psych.)	35,612	33,355	33,882	33,262	30,855	4,676	4,772
Total	144,851	141,743	145,780	143,440	141,543	21,606	22,033
ge Length of Stay (Days)							
t Medical/Surgical	9.1	8.3	8.4	8.4	8.4	8.4	8.5
t Psychiatry/ habilitation*	22.7	23.7	21.8	17.5	15.8	17.0	14.6
atric (including Psych.)	9.7	8.9	8.2	8.1	7.2	7.2	7.1
Total	9.7	9.0	8.7	8.6	8.3	8.3	8.3
pancy Rates							
ased on average beds in use)							
t Medical/Surgical	92.5	91.2	91.4	88.2	88.8	88.3	91.2
t Psychiatry/ habilitation*	78.9	76.1	70.7	79.4	77.8	80.4	73.0
atric (including Psych.)	87.4	81.8	79.4	78.8	73.1	72.0	73.5
Total	89.8	87.3	87.2	85.4	84.3	83.9	85.9
[illegible] STATISTICS							
ts	233,491	242,784	269,799	271,738	284,353	42,584	48,129
om Visits	26,246	27,347	27,373	26,864	27,061	4,199	4,012
[illegible] STATISTICS							
ating Room Hours	22,797	25,289	27,274	27,486	28,764	4,207	4,633
Surgery Procedures	3,490	3,598	4,028	4,273	4,672	714	901
ratory CAP Units (000)	12,950	13,737	14,885	15,849	16,730	2,535	2,800
cans	6,929	6,571	8,403	9,454	12,111	2,422	1,808
Scans	2,011	2,953	3,113	3,747	3,616	520	589
nostic Radiology Exams elative value units)	776,740	862,513	974,758	996,199	1,087,037	152,956	186,602
atient Visits specialty clinic)							
ral Medical	27,632	30,499	33,266	34,864	37,592	5,594	6,540
gery	6,079	6,891	7,663	7,803	9,158	1,424	1,571
iatrics	32,533	34,416	36,158	38,585	43,350	5,921	6,822
ecology	17,937	19,593	23,816	21,999	21,751	3,369	3,941
ical Specialty	104,492	109,277	124,167	125,070	129,970	19,859	22,362
abilitation*	2,326	2,500	2,407	0	0	0	0
tal Health	38,976	39,608	42,322	43,414	42,529	6,417	6,893
al	229,975	242,784	269,799	271,735	284,350	42,584	48,129

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rce: Hospital records

ehabilitation service closed in 1989.

Overall, outpatient activity and inpatient activity measured by admissions, in both cases adjusted for a 53 week year in 1989, increased consistently between 1987 and 1991. Over this four year period, the average annual growth rate was 3.8% for inpatient admissions and 5% for clinic visits. If admissions to the rehabilitation unit prior to its closure were excluded, admissions to continuing inpatient services grew at an average annual rate of 4.0% from 1987 to 1991. Emergency department visits remained relatively stable, due in part to patients being diverted to other hospitals on days when all NEMCH intensive care beds were full.

Hospital management attributes most of the growth in patient activity to several factors:

1. The Hospital has consistently sought to maintain strong referral relationships with HMOs and PPOs. Management estimates that virtually all of the growth in inpatient admissions since 1987 can be accounted for by increases in HMO/PPO referrals. (See "ALTERNATIVE DELIVERY SYSTEMS.")

2. Due in part to physician recruitment, the number of full-time physician staff at the Hospital has grown 12% since 1989. (See "HOSPITAL MANAGEMENT AND PERSONNEL - Medical Staff.")

3. Treatment protocols in many areas - particularly cancer care and neonatal care - have become increasingly complex. As a result, more patients who once would have been treated at community hospitals are being referred to NEMCH and other teaching hospitals for care.

Average length of stay ("ALOS") has declined for all services in the Hospital since 1987. This is particularly true in pediatrics, where ALOS fell by 26% between 1987 and 1991. Hospital management attributes the decline in the pediatric ALOS to a policy, adopted by the Hospital in October 1990, of transferring neonatal and other pediatric patients back to community hospitals as soon as medically feasible. The decline in adult and pediatric ALOS has enabled the Hospital to accommodate growth in admissions without a substantial increase in the number of inpatient beds.

The reduced ALOS more than offset additional patient days due to the increase in admissions, so that total patient days fell 2.1% from 1987 to 1991, total occupancy, reflecting both more average beds in service and fewer patient days, fell from 89.8% in 1987 to 84.3% in 1991. Excluding the discontinued rehabilitation service, patient days increased 1.6% from 1987 to 1991, and 1987 occupancy would have been 86.2%.

LICENSES AND ACCREDITATION

NEMCH is licensed by the Massachusetts Department of Public Health and is accredited by the Joint Commission on Accreditation of Healthcare Organizations for a three-year period expiring in 1993. The Hospital is accredited by the Accreditation Council on Graduate Medical Education for residencies and internships for 33 programs.

FINANCIAL INFORMATION

Summary of Revenue and Expenses

The following consolidated Statements of Revenue and Expenses for the five fiscal years ended September 28, 1991 were derived from the audited financial statements of the Hospital examined by Coopers & Lybrand, independent certified public accountants. Appendix B to this Official Statement sets forth the audited balance sheet of NEMCH as of September 29, 1990 and September 28, 1991, and the related statements of revenue and expenses, changes in fund balances, and cash flows of general funds for the years then ended, together with the report of Coopers & Lybrand. The consolidated Statements of Revenue and Expenses for the eight week period ended November 24, 1990 and November 23, 1991, which were not audited by Coopers & Lybrand, reflect, in the opinion of management of the Hospital, all adjustments (including normal recurring adjustments) necessary to summarize fairly the results for such periods. The results for the eight week period ended November 24, 1990 and November 23, 1991 should not be considered to be indicative of the results for the full fiscal years. The statements contained in this Appendix A should be read in conjunction with the financial statements of the Hospital and related notes and the accountant's report included in Appendix B.

SUMMARY OF REVENUE AND EXPENSES

	1987	1988	1989	1990	1991	Eight weeks ended November 24, 1990	Eight weeks ended November 23, 1991
				(in thousands of dollars)		(unaudited)	(unaudited)
patient services revenue	$168,814	$187,521	$206,526	$224,892	$266,059	$ 36,955	$ 44,198
r operating revenue:							
Direct expenditures on grants, contracts, and other activities	15,527	19,947	21,002	21,359	23,005	3,446	3,960
Other revenue	15,757	18,424	18,966	20,325	20,299	3,534	3,359
Total other operating revenue	31,284	38,371	39,968	41,684	43,304	6,980	7,319
Total operating revenue	200,098	225,892	246,494	266,576	309,363	43,935	51,517
ating expenses:							
Salaries and wages	76,600	86,912	97,673	106,484	119,451	17,627	20,098
Fringe benefits	10,110	11,742	14,604	17,348	19,660	2,758	3,284
Services of physician groups	19,084	20,945	22,997	24,538	29,608	4,020	5,333
Supplies and expenses	51,021	55,086	58,479	62,436	71,870	10,031	11,749
Interest, net of investment income	6,606	6,682	6,913	7,219	6,813	1,223	1,298
Depreciation and amortization	14,157	15,231	14,845	14,404	17,662	2,306	2,480
Direct expenditures on grants, contracts and other activities	15,527	19,947	21,002	21,359	23,005	3,446	3,960
Provision for bad debts	6,433	11,690	9,406	7,863	12,086	1,856	2,451
Total operating expenses	199,538	228,235	245,919	261,651	300,155	43,267	50,653
rating gain (loss)	560	(2,343)	575	4,925	9,208	668	864
operating income							
Net investment income	2,234	3,017	3,904	7,092	8,469	1,288	1,276
Net realized gains on investments	4,655	559	1,386	1,557	1,487	11	5
Total nonoperating income	6,889	3,576	5,290	8,649	9,956	1,299	1,281
ess of revenue over expenses before extraordinary gain	7,449	1,233	5,865	13,574	19,164	1,967	2,145
raordinary gain on advance refunding of debt	-	-	-	-	9,133	-	-
ess of revenue over expenses	$ 7,449	$ 1,233	$ 5,865	$ 13,574	$ 28,297	$ 1,967	$ 2,145

rce: Hospital's records

Management's Discussion of Recent Financial Performance

The Hospital has shown consistent improvement in operating performance since 1988, with an operating gain of $9.2 million in 1991. The Hospital realized an extraordinary gain of $9.1 million in 1991 from the reimbursement of prior extraordinary losses resulting from a refinancing in 1986 of certain outstanding indebtedness.

NEMCH management attributes the operating loss in 1988, and the small operating gains in 1987 and 1989, primarily to rising wages coupled with regulatory restrictions on the Hospital's ability to raise revenues. Staff shortages existed in many personnel categories during this period, particularly in nursing where a shrinking supply proved inadequate to meet the demand of area hospitals for nursing services. At the same time, low unemployment rates and a rising cost of living resulted in a sharp increase in wage levels throughout the Boston area. The Hospital's contract with the Massachusetts Nurses Association called for wage increases of approximately 18% per year in both 1988 and 1989, and unanticipated salary increases were required for medical technologists and other health care personnel as well. The Hospital was not able to pass on these increased salary costs in the form of higher charges, due to restrictions imposed by the Commonwealth of Massachusetts (the "Commonwealth") on revenues from non-Medicare patients and to the phase-in of national rates for Medicare patients. These restrictions are described more fully in "SOURCES OF PATIENT SERVICE REVENUE."

In 1990 and 1991, unemployment rates rose in the Boston area and wage pressures were substantially reduced. Nursing salaries rose by approximately 12% in 1990 and 10% in 1991. Salary and wage expense as a whole (after adjusting for the 53-week year in 1989) rose 11.1% in 1990 as compared to 10.3% in 1989 and 13.5% in 1988. In 1991, salary expense rose 12.2%, due in part to increases in staffing necessary to accommodate growth in admissions and clinic visits. (See "UTILIZATION.")

At the same time that wage pressures were moderating, restrictions on the Hospital's ability to raise revenues were lessened. The reimbursement system in effect until September 30, 1991 ("Chapter 23") allowed increases in revenues based on increases in patient volume, so that as Hospital utilization increased, the ability of the Hospital to raise revenue also increased. (See "SOURCES OF PATIENT SERVICE REVENUE.") During 1990 and 1991, the Hospital was in an "undergenerated revenue" position, meaning that the revenues it was collecting were less than the revenue caps imposed by Chapter 23. As a result, the Hospital could keep most of the revenue generated by charge increases. Responding to this "undergenerated" position, the Hospital instituted charge increases of 9% for inpatient and outpatient ancillary services in October 1990 and 6.5% for all services, including outpatient physician charges, in January 1991. The increased ability to raise and retain revenues, together with the reduced upward pressure on wages, are viewed by Hospital management as the most important reasons for improved operating margins in 1990 and 1991.

NEMCH management periodically compares its charge structure with publicly available data from other Boston teaching hospitals and strives to maintain a level of charges competitive with these hospitals. It is this competitive factor, rather than revenue caps imposed by statutory rate limitations, that is now the primary determinant of the size and timing of Hospital charge increases. Hospital management does not expect such revenue caps imposed under the newly enacted Massachusetts hospital finance statute to adversely affect the Hospital. (See "SOURCES OF PATIENT SERVICE REVENUE-Non Medicare.")

Fringe benefit expense increased at a compound annual rate of 18.1% between 1987 and 1991. This increase was due to the increase in staff associated with greater patient volume, to the rising cost of health insurance and other employee insurance costs, and to higher Social Security tax rates. Under the Hospital's flexible benefits program, employees receive a fixed credit towards fringe benefits, providing an incentive to use less expensive health insurance options. (See "HOSPITAL MANAGEMENT AND PERSONNEL-Employees.") As of 1990, all NEMCH employees requesting health insurance coverage were required to choose some form of managed care coverage.

Payment to physician groups for services provided at the Hospital increased at a compound annual rate of 11.6% between 1987 and 1991, an increase proportional to the growth in patient services revenue during the period. Rising physician recruitment costs also contributed to this increase, particularly in 1991 when physician chiefs of service were recruited in several departments. (See "HOSPITAL MANAGEMENT AND PERSONNEL-Medical Staff.")

Supplies and expenses increased by approximately 5.9% in 1988, 6.2% in 1989 and 6.8% in 1990, but by approximately 15% in 1991. Over half of the 1991 increase was due to medical supply cost increases and to increased patient activity. However, several one-time expenses were also incurred during 1991, including the implementation of a new patient billing system (see "Management Information Systems"), funding commitments related to patient outcomes research (see "RESEARCH"), and increased plant maintenance expense resulting from an increased effort to upgrade and redecorate the Hospital's older buildings.

Interest expense increased slightly between 1987 and 1991, as new debt was issued in 1988 and 1989 and as projects financed by this debt and prior borrowing were completed so that interest was no longer capitalized. (See "Outstanding Long-term Indebtedness.") Depreciation expense remained fairly constant until 1991, when significant investments in computer equipment and other capital projects as well as a write off of the remaining book value of buildings scheduled for demolition resulted in a $3.3 million increase in depreciation.

The provision for bad debts increased by $4.2 million in 1991, after having declined in the two previous years. This was partly the result of the two charge increases (totalling 15.5%) implemented during 1991 as described above and partly the result of increased unemployment and loss of health insurance coverage among patients in the Boston area.

Net patient service revenue during October and November of 1991 was 19.6% higher than for the comparable period in 1990. This was due in part to the 6.5% charge increase implemented in January 1991, in part to continued growth in inpatient and outpatient activity, and in part to an increase in case mix intensity. Inpatient admissions for October and November of 1991 were 2.5% higher, and outpatient clinic visits were 13.0% higher, than during the corresponding prior year period. (See "UTILIZATION.")

Operating expenses during October and November of 1991 were 17.1% higher than during the comparable prior year period. Payments for services of physician groups increased by 32.7%, due in part to the January 1991 charge increase and in part to the continued growth in outpatient clinic visits. The provision for bad debts increased by 32.1%, due both to charge increases and to continued high unemployment rates in the Boston area. Salaries and wages increased by 14.0% and supplies and expenses by 17.1%, in both cases reflecting continued growth in utilization and case mix intensity. Interest and depreciation expense increased by 6.1% and 7.5% respectively.

Management Information Systems

The Hospital has made a significant commitment to developing and maintaining sophisticated information systems. Since 1985, the Hospital has used the cost accounting systems of Transition Systems, Inc. ("TSI"), an affiliated corporation of the Hospital. (See "AFFILIATED CORPORATIONS".) Management believes that the extensive use of TSI systems has allowed Hospital personnel to improve their understanding of the NEMCH cost structure. In particular, these systems have helped the Hospital to negotiate managed care contracts successfully and to monitor the financial results of these contracts.

In 1991, the Hospital installed a new patient registration and patient accounting system, replacing and consolidating three older systems. Management believes that the new system's flexible architecture will enable it to respond in a more timely manner to the increasingly complex billing requirements of third parties. In addition, management expects that the system will reduce patient processing time and increase patient convenience.

Fund Raising

The fund raising activities of the Hospital were transferred to the Parent Corporation in 1983. (See "AFFILIATED CORPORATIONS.") However, some gifts are still received by the Hospital or are transferred by the Parent Corporation to the Hospital for certain purposes. Fund raising activities are coordinated by a professionally staffed development office maintained by the Parent Corporation. A campaign to raise funds for the expansion of research activity, the "Campaign for Research," raised $17.8 million between 1984 and 1988, including some pledges not yet paid. NEMCH management expects to begin another major capital fund raising campaign in 1992. The goal for this campaign has not been established.

The following table lists the contributions, gifts, and bequests received by the Hospital and the Parent Corporation for each of the years in the five year period ending September 28, 1991.

	1987	1988	1989	1990	1991
		(in thousands of dollars)			
Hospital:					
General funds	$ 78	$ 78	$ 103	$ 201	$ 80
Specific purpose	4,851	5,718	6,708	7,172	8,933
Plant replacement and expansion	83	51	0	0	0
Endowment	150	200	175	237	236
Total Hospital	5,162	6,047	6,986	7,610	9,249
Parent Corporation (excluding Hospital):					
General funds	25	246	432	817	817
Specific purpose	31	398	430	932	2,062
Plant replacement and expansion	2,287	2,325	216	(533)*	(880)*
Total Parent Corporation	2,343	2,969	1,078	1,216	1,999
TOTAL PARENT CORPORATION AND HOSPITAL	$7,505	$9,016	$8,064	$8,826	$11,248

Source: Hospital records

* These items represent funds raised during the Campaign for Research. A portion of the funds pledged during previous years was determined to be uncollectible in 1990 and 1991, respectively.

Funds held by the Parent Corporation are not available, and restricted funds of the Hospital may not be available, to make payments on the Series F Bonds or to meet the claims of general creditors.

Outstanding Long-term Indebtedness

As of September 28, 1991, the Hospital's long-term indebtedness, including the current portion thereof, totalled $119,520,000 and was comprised of:

(1) A $79,170,000 outstanding balance on a loan from the proceeds of the Authority's Revenue Bonds, New England Medical Center Hospitals Issue, Series D, bearing interest at rates ranging from 5.60% to 7.2% with principal maturities and sinking fund payments due on an annual basis in varying amounts and with a final maturity of July 1, 2010.

(2) A $24,950,000 outstanding balance on a loan from the proceeds of the Authority's Revenue Bonds, New England Medical Center Hospitals Issue, Series E, bearing interest at rates ranging from 6.25% to 7.875% with principal maturities and sinking fund payments due on an annual basis in varying amounts and with a final maturity of July 1, 2011.

(3) A $15,400,000 outstanding balance on a loan from the proceeds of the Authority's Revenue Bonds, Capital Asset Program Issue, Series F, bearing interest at rates ranging from 6.10% to 7.30% with principal maturities and sinking fund payments due on an annual basis in varying amounts and with a final maturity of October 1, 2003.

Insurance

The Hospital maintains the following insurance coverage:

(i) Blanket building, contents, and time element coverage for all locations owned, rented or controlled by the Hospital in the amount of $507,143,334. This policy is written on an "all-risk" basis including flood and earthquake coverage with no co-insurance and with deductibles of $5,000 per any one loss other than by flood or earthquake, which carry a $25,000 deductible.

(ii) Comprehensive general liability insurance through New England Medical Center Insurance Company ("NEMCIC") with limits for all named insureds of NEMCIC of $5,000,000 per occurrence and $20,000,000 annual aggregate. The named insureds consist of: the Hospital, the Parent Corporation, TMCA Foundation, Inc., Pratt Medical Group, Inc., and certain other members of the Hospital's medical staff. A commercial excess policy with limits of $50,000,000 is maintained above this primary insurance. Medical professional liability insurance through NEMCIC with limits for all named insureds of NEMCIC of $2,500,000 per defendant per claim and $5,000,000 per defendant annual aggregate and combined limits of $10,000,000 each claim and $20,000,000 annual aggregate.

NEMCIC is a for-profit corporation organized under the laws of the Cayman Islands, British West Indies, that provides comprehensive general and professional liability coverage for the Hospital, all full-time members of the medical staff of the Hospital, and the Hospital's residents and fellows. The entire $20,000,000 of coverage which NEMCIC provides annually to all of its insureds is equally available to satisfy the claims of any of the insureds. NEMCIC funds reserves on an actuarial basis. As of September 30, 1991, the assets of NEMCIC were approximately $39,911,328, substantially all of which was reserved for payment of claims. The Hospital holds 62 1/2% of the stock of NEMCIC; TMCA Foundation, Inc. holds 25%; and Pratt Medical Group, Inc. holds 12 1/2%. The Hospital is obligated to pay NEMCIC $1,175,000 on demand, in satisfaction of its original capital contribution. In addition, the shareholders of NEMCIC are subject to assessment by NEMCIC in an amount not to exceed in the aggregate $5,000,000. The size of each shareholder's assessment is in direct proportion to the ratio of premiums paid to NEMCIC by each shareholder to the total premiums paid by all shareholders. Based on current premium contributions, the Hospital would be obligated to contribute approximately 53% of any such assessment. The Hospital's financial statements include its proportionate interest in NEMCIC.

In addition, the Hospital is self-insured for workers compensation in the amount of $400,000 per occurrence with an excess policy with limits of $20,000,000 per claim above this retention and maintains directors and officers liability insurance, blanket employee dishonesty insurance, automobile liability insurance, travel and accident insurance, business interruption insurance, airport (helipad) liability insurance, and non-owned aircraft liability insurance.

Investments

The Investment Committee of the Board of Trustees of the Parent Corporation oversees the management of the Hospital's investments. The Hospital employs two firms to manage its equity investments and one firm to manage its fixed income investments on a day-to-day basis; all investments other than cash and money market accounts are managed by these outside firms. Performance and market value of all investments is reported to the Investment and Finance Committees of the Parent Corporation on a quarterly basis. A summary of investments at market value as of the end of each year in the three-year period ended September 28, 1991 is as follows:

	September 30, 1989	September 29, 1990	September 28, 1991
	(in thousands of dollars)		
General Funds			
Current portion of assets whose use is limited	$ 3,649	$ 7,788	$ 32,583
Assets whose use is limited:			
By Board for capital improvements	37,896	65,628	68,181
By Board for designated purposes	13,189	13,955	--
Professional and general liability	22,972	29,947	31,410
Under bond indenture agreements	27,961	22,231	18,569
Total General Funds	105,667	139,549	150,743
Donor Restricted Assets			
Specific purpose funds	17,818	18,274	19,523
Plant replacement and expansion funds	4,809	5,033	5,611
Endowment funds	21,149	20,245	23,107
Total Donor Restricted	43,776	43,552	48,241
Total Investments	$149,443	$183,101	$198,984

Source: Hospital Records

Restricted funds of the Hospital may not be available to make payments on the Series F Bonds or to meet the claims of general creditors.

Capital Expenditures

Capital expenditures for each of the years in the five year period ended September 28, 1991 were as follows:

1987	$13,691,000
1988	12,761,000
1989	17,084,000
1990	19,544,000
1991	31,902,000

Source: Hospital Records

HOSPITAL FACILITIES

Set forth below is a list of all buildings used by NEMCH; the year each was constructed and, if applicable, substantially renovated; the number of levels; the approximate gross square footage; and the current use. All of these buildings are owned by NEMCH, except as otherwise indicated in footnotes to the schedule below.

Building	Year of Construction (and Substantial Renovation)	Number of Levels	Approximate Gross Square Feet	Current Use
Proger	1973 (1985)	10	187,343	Inpatient rooms, clinical laboratories, administration, diagnostic services, medical offices, research, radiology, radiation therapy, and support services.
Pratt	1938 (1985)	7	51,766	Inpatient rooms, ambulatory surgery, administration, medical offices, and support services.

Farnsworth	1947 (1985)	7	100,264	Inpatient rooms, ambulatory surgery, administration, medical offices, and support services.
Boston Floating Hospital	1982	9	282,390	Inpatient pediatric rooms, operating and recovery rooms, medical offices, support services, radiology, pediatric ambulatory care, clinical laboratories, diagnostic services, administration, and gift shops.
Biewend	1924 (1983)	15	145,000	Ambulatory care, medical offices, support services, administration, and clinical laboratories.
Ziskind	1925 (1988)	8	100,955	Research, medical offices, support services, and clinical laboratories.
Rehabilitation	1958	6	53,907	Inpatient rooms, emergency department, administration, medical offices, and research.
Center	1930	6	49,331	Inpatient rooms, medical offices, ambulatory care, and support services.
MRI	1986	1	9,213	Diagnostic services and research.
	1875	4	15,039	Administration and support services.
	1883	5	47,350	Research, ambulatory care, medical offices, support services, and administration.
Jackson (1)	1930	5	24,504	Administration.
Hemenway (1)	1915	5	10,550	Administration.
Staff Education (1)	1870	3	3,072	Education.
Tupper	1924 (1986)	15	110,510	Research and administration.
Holmes	1880	5	16,076	Administration and coffee shop.
17 Nassau Street (1)	1880	4	5,587	Administration.
Dental (2)	1973	10 (hosp. occupies 3)	24,748	Inpatient rooms, truck dock, mail room linen and materials holding.
35 Kneeland Street (3)	1924 (1987)	11 (hosp. occupies 10)	64,000	Computer operations, support services, non-wet laboratory research, ambulatory care.
100 Boylston(4)	1991	10 (hosp. occupies 1)	9,677	Legal services, risk management services and NEMC Real Estate Company, Inc.
643 Summer Street(5)	N/A	1	200,000	Warehouse

Source: Hospital records

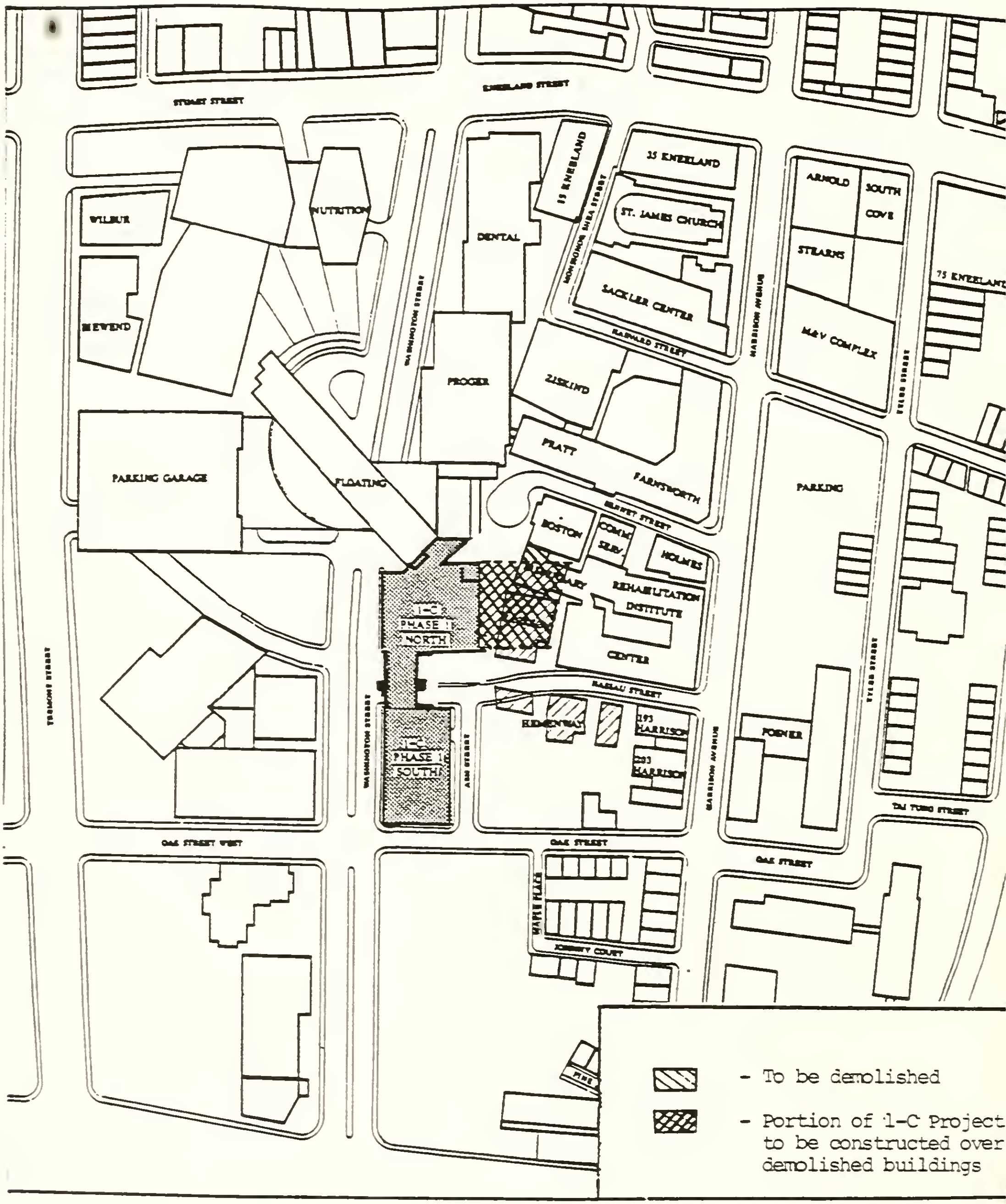
(1) The Jackson, Hemenway, Staff Education, and 17 Nassau Street buildings, and a portion of the Boston Dispensary building, will be demolished prior to completion of the Project. The Hemenway, Staff Education, and 17 Nassau Street buildings are owned by the Boston Redevelopment Authority and leased by the Hospital.

(2) The Hospital holds an easement covering two floors of the Dental Building which is owned by Tufts University. The total building area is approximately 220,424 gross square feet.

(3) The Hospital leases space on ten floors of 35 Kneeland Street which is owned by NEMC Real Estate Company, Inc. See "Affiliated Corporations." The total building area is approximately 104,000 gross square feet.

(4) The Hospital leases space on one floor.

(5) The Hospital leases this space.



NEW ENGLAND MEDICAL CENTER

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THE PROJECT

The Project includes the following components:

(a) Construction of an eight story building of approximately 218,327 gross square feet (the "1-C North Building"), located on the east side of Washington Street directly south of the existing Proger and Boston Floating Hospital buildings, to house the emergency department, an operating room/day surgery suite, and a variety of inpatient care activities. This portion of the Project also includes renovation of approximately 11,000 gross square feet of the adjacent Proger Building. Total costs, including equipment and furnishings but excluding financing costs, are estimated at $75,500,000, of which up to 80% may be financed from proceeds of the Series F Bonds.

At present, most emergency pediatric patients are treated in the Boston Floating Hospital building, while the adult emergency department is located in a building constructed in 1958 on a one-way street located at the opposite end of the Hospital campus from operating rooms, intensive care units and most tertiary treatment areas. The 1-C North Building will consolidate both emergency care facilities and will increase their capacity. The current day surgery suite, although completed in 1985, has not been able to accommodate the growth in outpatient surgical procedures since that time. In addition to increased capacity, the new 1-C North Building operating room/day surgery suite will share certain facilities with the existing operating room suite in the adjacent Boston Floating Hospital building. Other inpatient services in the 1-C North Building will include an expanded maternity service (See "HOSPITAL SERVICES - Inpatient Services"), an expanded neonatal intensive care unit and the relocation of 60 adult medical/surgical beds, including most of the beds now used to treat hematology/oncology and cardiology patients, from the Pratt and Farnsworth buildings, which were constructed in 1938 and 1947 respectively.

(b) Construction of an eight story building of approximately 158,000 gross square feet (the "1-C South Building"), located on the east side of Washington Street immediately to the south of the 1-C North Building, to house a variety of outpatient care activities. This new facility is expected to alleviate delays and scheduling difficulties that have arisen from the recent growth in outpatient clinic visits, in spite of efforts to accommodate this growth through increased evening and weekend clinic hours. Total costs, including equipment and furnishings but excluding financing costs, are estimated at $41,300,000.

(c) Renovations of and equipment for outpatient clinic facilities in the Biewend Ambulatory Care Center and the Boston Floating Hospital building at an estimated cost of $5,900,000.

(d) Replacement of radiology facilities and equipment, including three computerized tomography scanners at an estimated cost of $3,700,000.

(e) Replacement and upgrading of the sprinkler and fire alarm systems in the Pratt, Farnsworth, and Proger buildings at an estimated cost of $2,200,000.

(f) Renovations of and equipment for the operating room suite and for existing inpatient facilities in the Proger and Boston Floating Hospital buildings at an estimated cost of $2,000,000.

(g) Other renovations and equipment for patient care, research and support services at the Hospital's existing facilities.

The 1-C North and South Buildings are being designed by the architectural firm of Shepley, Bulfinch, Richardson & Abbott, Boston, with construction scheduled to begin in the fall of 1992 or early in 1993. Construction cost estimating and consulting services are being provided by Turner Construction Company. NEMCH expects to hire a construction manager for the project by the summer of 1992.

The Hospital has obtained a Determination of Need ("DON") for the 1-C North Building from the Massachusetts Department of Public Health. The Hospital is considering seeking an amendment to the DON relating primarily to relocation of clinical components of the Project, but is prepared to proceed with the Project as currently approved if a request for amendment is not approved. No other portion of the Project requires a DON.

The Hospital is in the process of obtaining other necessary permits and approvals for the construction of the Project. The Hospital believes that such permits and approvals will be obtained as needed, although no assurances can be given at this time. Any delay in obtaining necessary approvals could delay commencement of the Project and result in an increase in total Project costs. If the necessary permits and approvals are not obtained or are obtained on terms unacceptable to the Hospital, the Agreement provides that the Hospital may seek approval from the Authority to use the proceeds of the Series F Bonds for other projects or may redeem Series F Bonds. See "THE PROJECT - Required Regulatory Approval of the Project" in the forepart of this Official Statement.

FUTURE FACILITIES PLANS

Hospital management projects that capital expenditures, including an estimated $135 million for the Project, will be in excess of $250 million over the next five years. The majority of these expenditures are expected to be for clinical facility renovation and expansion, with the remainder for research facilities and routine annual capital needs including equipment. NEMCH expects to fund capital projects other than those financed with the Series F Bonds primarily from internally generated funds or funds currently available under previous borrowings.

By the summer of 1992, the Hospital expects to have entered into leases for approximately 55,000 net rentable square feet of office and support space in several off-site locations, thereby accommodating non-clinical support services such as finance and computer operations, and legal staff. These leases will replace space lost due to the demolition of the Jackson, Hemenway, 17 Nassau Street, and Staff Education buildings (see "HOSPITAL FACILITIES") and will also permit the expansion of certain on-site clinical facilities.

In 1992, the Hospital expects to commence construction of two additional floors on the Pratt Building. The new floors, expected to be in service in 1993, will house a Neurosurgical Intensive Care Unit containing eight relocated beds and two new beds and a new adult medical/surgical unit of approximately 16 beds. A portion of the cost of this addition is being financed through proceeds of the Series E Bonds.

The Hospital is also considering constructing a new facility in the space between the new 1-C North Building and the existing Proger and Boston Floating Hospital buildings. The facility is expected to include a main entrance, an atrium, food services and other public amenities, and a 200 seat auditorium. Upper floors of the facility will include connecting corridors, reception areas, and public areas for use by patients and visitors. The total cost is estimated at $6.5 million, which the Hospital intends to fund through equity.

Hospital Corporation and Board of Governors

Acting through its 13-member Board of Trustees, the Parent Corporation serves as the sole member of the Hospital. As such, it is responsible for electing annually the Hospital's Board of Governors, except the President of Tufts University and the Dean of the Medical School who serve as Governors ex-officio, with voting rights. The Board of Governors currently consists of 25 members. Nine members of the NEMCH Board of Governors also serve on the Board of Trustees of the Parent Corporation.

The NEMCH Board of Governors meets approximately six times per year and has several standing committees, including the Professional Standards, Patient Care, and Development Committees. Standing committees of the Board of Trustees of the Parent Company include the Investment, Finance, Nominating and Audit Committees.

The members of the Board of Governors of NEMCH, their initial year of election and their principal affiliations are as follows:

Governor	Initial Year of Election	Principal Affiliation
Walter M. Cabot (1) Chairman	1976	Senior Advisor and Director, Standish, Ayer & Wood, Inc., Boston
Jerome H. Grossman, M.D. (1) President	1979	President and Chief Executive Officer, New England Medical Center Hospitals, Inc., Boston
[illegible] Burling, Esq. (1) Secretary	1976	Partner, Foley, Hoag & Eliot, Boston
James N. Bailey (1) Treasurer	1986	Managing Director, Cambridge Associates, Boston
Patricia Baker	1991	Community Leader
Shepard Brown	1976	The Real Estate Developer, Byrne McKinney & Associates, Inc., Boston
Lalor Burdick (1)	1982	Vice President, Scudder, Stevens & Clark, Inc., Boston
John G. L. Cabot	1983	Executive Vice President, Cabot Corporation, Boston
Robert L. Caporale, Esq.	1980	Partner, Eckert, Seamans, Cherin & Mellott, Boston
John A Cervieri, Jr. (1)	1982	Managing Trustee, Property Capital Trust, Boston
Jill Ker Conway, Ph.D.	1988	Visiting Professor, Massachusetts Institute of Technology, Cambridge
Dolores S. Driscoll	1989	Managing Director, Standish, Ayer & Wood, Inc., Boston
Amy C. Guen	1981	Social Worker
O. W. Haussermann, Jr., Esq. (2)	1965	Partner, Ropes & Gray, Boston
William Hodgins	1988	President, William Hodgins, Inc., Boston
Charles R. LaMantia, D.Sc.	1989	President and Chief Executive Officer, Arthur D. Little, Inc., Cambridge
Henry F. McCance (1)	1986	Managing Partner, Greylock Management Corp., Boston
Jean Mayer, Ph.D. (ex officio)	1976	President, Tufts University, Medford
William G. Meserve, Esq.(1)	1982	Partner, Ropes & Gray, Boston
Rodger P. Nordblom	1980	President, Nordblom Company, Boston
John F. Rockart, Ph.D. (1)	1986	Director, Center for Information Systems, Massachusetts Institute of Technology, Cambridge
Richard M. Ryan, D.Sc. (ex officio)	1990	Interim Dean, Tufts University School of Medicine, Boston
Gabriel Schmergel	1990	President, Genetics Institute, Cambridge
Hon. Robert C. Seamans, Jr.	1990	Professor, Massachusetts Institute of Technology, Cambridge
Frederick A. Wang	1990	Consultant, Wang Laboratories, Lowell

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(1) Member of the Board of Trustees of the Parent Corporation.
(2) Mr. Haussermann did not serve as a member of the Board during 1978 and 1979.

Ropes & Gray, of which Messrs. Haussermann and Meserve are partners, serves as counsel to the Hospital and will render its opinion with respect to certain matters concerning the Series F Bonds. In addition, from time to time the Hospital has retained the services of or entered into business transactions with firms, corporations, and organizations of which members of the Board are officers, partners or principals. Hospital management believes that all such transactions were on terms no less favorable than could be obtained from other parties.

Management

The senior management of the Hospital consists of the President, the Chief Financial Officer, the Executive Vice President and Chief Operating Officer, the Chair of the Department of Nursing, the Physician-in-Chief, the Surgeon-in-Chief, and the Pediatrician-in-Chief. Biographical information for these individuals is as follows:

Jerome H. Grossman, M.D., age 52, has been President and Chief Executive Officer of the Hospital since 1979. Dr. Grossman was the Director of the Ambulatory Care Division of Massachusetts General Hospital ("MGH") from 1974 to 1979 and served in the U.S. Air Force from 1972 to 1974. Between 1966 and 1972 he served at MGH in several capacities, including Associate Director of the Laboratory of Computer Science and Associate Director of the MGH Medical Clinics. Dr. Grossman received a B.S. degree from the Massachusetts Institute of Technology, Cambridge and an M.D. degree from the University of Pennsylvania, Philadelphia, Pennsylvania. He is Deputy Chairman of the Federal Reserve Bank of Boston and is also a Trustee or Director of Wellesley College, Boston Private Industry Council, Tufts Associated Health Plan, Stryker Corporation, Meditech, and Arthur D. Little, Inc.

Dorothy E. Puhy, age 40, has been Chief Financial Officer of the Hospital since 1988, having joined the Hospital in 1985 as Vice President for Finance. Between 1978 and 1985 she worked as a health care consultant for the public accounting firm of Ernst & Whinney (now Ernst & Young). From 1975 to 1978 she worked at the Massachusetts Rate Setting Commission, where she was Director of the Hospital Bureau beginning in 1976. Ms. Puhy received B.A. and M.B.A. degrees from the University of Pennsylvania, Philadelphia, Pennsylvania. She has served as President of the Massachusetts chapter of the Healthcare Financial Management Association, as a member of the Massachusetts Hospital Association's Committee on Finance, and as a lecturer at the Harvard School of Public Health.

David J. Trull, age 44, is Executive Vice President and has been Chief Operating Officer of the Hospital since 1982. Mr. Trull joined the Hospital in 1972, and has served as Administrative Assistant in the Department of Surgery, Assistant Director for Special Services, and Associate Director. Mr. Trull received a B.A. degree from the University of Notre Dame, South Bend, Indiana and an M.B.A. degree from Cornell University, Ithaca, New York.

M. Patricia Gibbons, R.N., D.N.Sc., age 46, has been Chair of the Department of Nursing of the Hospital since May 1991. From 1987 to 1991, Dr. Gibbons was the Vice President for Nursing at Yale-New Haven Hospital, New Haven, Connecticut. Between 1974 and 1987, Dr. Gibbons held several positions at Beth Israel Hospital, Boston, including Project Director for Primary Nursing, Director of Medical Nursing, and Administrative Director of Nursing. Between 1966 and 1974, Dr. Gibbons held several nursing staff and supervisory positions at Boston City Hospital. Dr. Gibbons received a Diploma in Nursing from Boston City Hospital School of Nursing, Boston, a B.S. degree in Nursing from Boston College, Newton, and M.S. and D.N.Sc. degrees from Boston University, Boston.

Sheldon M. Wolff, M.D., age 61, has been Physician-in-Chief of the Hospital since 1977. Prior to 1977, Dr. Wolff worked for 17 years at the National Institutes of Health. Dr. Wolff received a B.S. degree from the University of Georgia, Athens, Georgia, and an M.D. degree from Vanderbilt University, Nashville, Tennessee. He served as co-chairman of the National AIDS Task Force of the Institute of Medicine of the National Academy of Sciences and is a past chairman of the American Board of Internal Medicine. In 1987, he was chosen by the 60,000-member American College of Physicians to receive their annual award for "distinguished contributions" in internal medicine. In 1991, he received the "Distinguished Research in the Biomedical Sciences Award" of the Association of American Medical Colleges.

Richard J. Cleveland, M.D., age 59, has been Surgeon-in-Chief of the Hospital since 1984 and Chairman of the Department of General Surgery since 1975. He has also served as the Chairman of the Department of Cardiothoracic Surgery at both NEMCH and St. Elizabeth's Hospital, Boston, since 1972. Dr. Cleveland received a B.S. degree from Tufts University, Medford and an M.D. degree from the Medical College of Virginia, Richmond, Virginia. He has served as a Director of the American Board of Surgery and as Chairman of the American Board of Thoracic Surgery, a group for which he currently serves as Secretary/Treasurer.

Jane G. Schaller, M.D., age 57, has been Pediatrician-in-Chief of the Hospital since 1983. Dr. Schaller previously served as Professor of Pediatrics at the University of Washington and simultaneously as Head of the Division of Rheumatic Diseases at Children's Hospital, both in Seattle, Washington. She received an A.B. degree from Hiram College, Hiram, Ohio and an M.D. degree from Harvard University, Cambridge.

Medical Staff

Virtually all of the full-time members of the medical staff of the Hospital are employed by TMCA Foundation, Inc. ("TMCA"), Pratt Medical Group, Inc., or NEMC Group Practice, Inc., all of which are Massachusetts charitable corporations. These organizations contract annually with the Hospital to provide to the Hospital substantially all the patient care, teaching, and administrative services of the medical staff. The contracts generally require physicians to treat most of their private outpatients through the clinics of the Hospital rather than through private offices.

TMCA employs approximately 250 full-time members of the Hospital's medical staff, representing the active medical staff of 15 departments of the Hospital. At the recommendation of Hospital management, TMCA has announced its intention to reorganize into 15 separate Massachusetts charitable corporations. Hospital management anticipates entering into separate contracts with each of the new corporate entities on essentially the same terms and conditions as the existing contract with TMCA. This new corporate structure is expected to facilitate communication between the Hospital and each of the medical staff departments.

The full-time medical staff of the Hospital consisted of 378 physicians as of September 1991, approximately 90% of whom also hold teaching appointments at the Tufts University Schools of Medicine and Dentistry. 59.7% of full-time staff were 45 years of age or younger and 3.7% were 65 years of age or older.

The following table summarizes the number of full-time medical staff by department as of January 1989 and as of September 1991:

	Full-Time Staff as of:	
Department	January 1989	September 1991
Anesthesia	27	24
Dentistry	4	4
Dermatology	5	9
Gynecology	22	22
Medicine	81	104
Neurology	7	8
Neurosurgery	4	5
Ophthalmology	12	20
Orthopedic Surgery	10	9
Otolaryngology	3	4
Pathology	18	20
Pediatrics	44	61
Psychiatry	37	23
Radiation Oncology	6	7
Radiology	19	20
Rehabilitation Medicine	6	11
Surgery	19	22
Urology	3	5
TOTAL	327	378

Source: Hospital records

In addition to the Hospital's full-time staff, other physicians are appointed to associate, research, or other non-full-time staff positions. As of September 1991, approximately 717 physicians held such positions. These physicians generally do not have admitting privileges at the Hospital. In addition to its staff, the Hospital employs approximately 480 interns, residents and fellows (see "CLINICAL AND EDUCATIONAL AFFILIATIONS.")

Nursing Staff

As of September 28, 1991, the Hospital employed approximately 1,035 full-time equivalent employees ("FTEs") on its nursing staff. Of these, 53 FTEs were registered nurses in clinical administrative and support positions, 794 FTEs were other registered professional nurses, and the remainder were licensed practical nurses, nursing assistants, orderlies, technicians, and other personnel. Hospital management estimates that registered nurses provide approximately 76% of direct patient care in general units and 100% of such care in intensive care units. Approximately 71% of the registered nurses have a bachelor's degree in nursing. The turnover rate for the nursing staff during 1991 was approximately 6%, and the Hospital has not experienced significant difficulty in the past two years in recruiting adequate numbers of nursing staff. From 1987 to 1989, however, NEMCH, in common with most Boston hospitals, experienced higher nursing staff turnover and difficulties in recruiting, to which it responded by implementing an aggressive recruitment and retention program.

NEMCH was one of the first Boston hospitals to provide primary nursing in all its units, a concept whereby each patient is assigned a nurse who takes primary responsibility for the patient's care throughout his or her stay. Primary nurses are viewed as case managers and are responsible for certain standard outcomes, including an appropriate length of stay, effective and efficient use of resources, and established clinical standards for each case type. The Hospital believes this system improves patient care, creates greater professional autonomy and authority for the nursing staff, and results in more cost effective use of resources.

Other innovative nursing programs underway at NEMCH include a program for self-administration of patient medication; expanded employee health programs provided by the ambulatory nursing staff to NEMCH employees and to area businesses; and a computer based nursing information system, which measures both nursing intensity and the achievement of specific patient outcomes.

The Hospital has a collective bargaining agreement with the Massachusetts Nurses Association ("MNA"), which represents all non-supervisory registered nurses employed by the Hospital. The Hospital's contract with the MNA expired on September 23, 1991. The Hospital has recently concluded negotiations with the MNA, resulting in a tentative agreement that is subject to ratification by members of the nurses bargaining unit. The Hospital anticipates a vote on the contract in late February 1992.

Employees

As of October 1991, the number of employees on the NEMCH payroll was approximately 4,900, including nurses, residents, interns, and part-time, temporary and on-call personnel. This number includes employees involved in research and outpatient functions, but excludes the physician staff employed by independent physician groups. The number of FTEs paid through the Hospital's operating fund, which excludes research activities, was 3,205.1 as of September 28, 1991. During 1991, salaries, including fringe benefits, represented approximately 53% of the total operating expense of the Hospital, excluding uncompensated care and direct research expenses.

NEMCH was one of the first hospitals in the Boston area to provide a flexible benefits program to its employees. Under this program, employees are given a fixed dollar limit to allocate among a variety of possible fringe benefits including health insurance, dental insurance, disability insurance, life insurance, and accident insurance. An on-site child care center was opened in 1989. The children of NEMCH employees are given first preference for openings in the center, and subsidized rates are available for employees with household incomes below specified levels. Employees are also eligible for tuition reimbursement, a variety of in-house training programs, a voluntary tax sheltered annuity program, and a contributory defined benefit pension plan which is operated in compliance with the Employee Retirement Income Security Act. As of September 30, 1991, 1,295 employees participated in the pension plan, and the value of pension plan assets exceeded the actuarially computed present value of vested benefits by approximately $8.6 million.

Registered nurses are the only Hospital employees represented by a labor union. (See "Nursing Staff").

Volunteers

Over the course of each year, between 200 and 250 men and women volunteer their time to assist patients at the Hospital and to perform a wide range of essential services. Volunteers work as emergency escort aides, physical therapy aides, and laboratory aides. They also visit patients and operate an activities cart, a book cart, a flower delivery service, and a gift shop.

AFFILIATED CORPORATIONS

As part of a 1983 reorganization of the Hospital, New England Medical Center, Inc. was created to serve as the Parent Corporation for the Hospital and several other controlled affiliates and subsidiary corporations. The Parent Corporation is the sole member of its non-profit affiliates and sole or majority shareholder of each of its subsidiaries. It provides overall coordination and direction of the activities conducted by its affiliates and subsidiary corporations, including the Hospital, and is responsible for conducting fund-raising programs on behalf of the controlled affiliates.

NEMC Real Estate Company, Inc. is a not-for-profit subsidiary of the Parent Corporation that owns and operates certain real property not used exclusively by the Hospital. It owns the land and the 11-story building located at 35 Kneeland Street, most of which is used by the Hospital (see "HOSPITAL FACILITIES"), and is the owner of the land and building located at 272 Tremont Street and known as the Wang Center for the Performing Arts. NEMC Real Estate Company presently is developing plans to construct, own and operate two new parking garages with an aggregate capacity of 1600 spaces, for the principal use by Hospital patients, employees and visitors, at an estimated cost of $27.8 million.

Community Practice Program, Inc. ("CPP") is a not-for-profit subsidiary of the Parent Corporation organized to develop and provide programs, supplemental to the Hospital's existing programs, and to conduct research concerning primary care, home care, prevention, social support services, and other medical programs and services to the community, other institutions, and individual patients. During the most recent fiscal year ending September 28, 1991, CPP generated total revenues of $2.1 million and net income of $1.6 million. Each of CPP and an affiliate of Massachusetts General Hospital is a 47.95% general partner of Chartwell Home Therapies (formerly known as New England Health Resources), which provides certain therapies and services to patients who have been discharged to their homes in the New England states, Illinois and Pennsylvania. Services provided by Chartwell include parenteral and enteral nutrition therapy, intravenous antibiotic therapy, chemotherapy, pain management therapy, and respiratory therapy. Chartwell was one of the first home health care providers in the nation to combine the clinical standards and experience of an academic medical center with the expertise of a relatively large and established home health care company. During its most recent fiscal year ended September 30, 1991, Chartwell generated total revenues of $27.8 million and net income of $3.9 million.

Transition Systems, Inc. is a for-profit corporation, 78% owned by the Parent Corporation, with the balance of shares held by several present and former employees of the Hospital. TSI designs, develops and sells financial, clinical and strategic planning decision support computer software systems to hospitals and provides related consulting, maintenance and support services. In its most recent fiscal year ended September 28, 1991, TSI's total revenues and net income were $12 million and $1.2 million, respectively.

New England Long-Term Care, Inc. ("NEL-TC") is a tax-exempt stock corporation, all of the shares of which are owned by the Parent Corporation. It currently operates New England Pediatric Care, an 80 bed pediatric nursing home in Billerica, which it acquired in 1986. It also has entered into a partnership to own and operate a 224-bed nursing home on the campus of Lawrence Memorial Hospital of Medford ("Lawrence"), known as Courtyard Nursing Home, which began receiving patients in January 1992. NEL-TC holds a 33.3% general partnership interest; the other partners are an affiliate of Lawrence and a corporation, the President of which is also the President of ADS Management, Inc., a company which manages and operates approximately 1000 nursing home beds in Massachusetts.

Liability Limited, Inc. is a for-profit corporation owned 62.5% by the Parent Corporation, 25% by TMCA Foundation, Inc. and 12.5% by Pratt Medical Group, Inc. that provides risk management, claims administration, and related services to the Hospital and its nursing homes, physician groups and professional associations.

NEMC Basic Research Corporation, Inc. is a not-for-profit subsidiary of the Parent Corporation formed to conduct basic scientific research in medical and related fields for the benefit of the Parent Corporation and its affiliated organizations, including the Hospital.

Only the Hospital is obligated under the Agreement with the Authority relating to the Series F Bonds, and none of the assets of the above described corporations is available to make debt service payments on the Series F Bonds.

NO LITIGATION

There is no litigation pending or threatened against the Hospital (other than claims for malpractice against which the Hospital is insured) which, in the opinion of the Hospital's management, would materially adversely affect the Hospital's ability to meet its obligations under the Agreement in the event of an adverse result.

SOURCES OF PATIENT SERVICE REVENUE

The Hospital maintains agreements with Blue Cross and Blue Shield of Massachusetts, Inc. ("Blue Cross"), the federal Medicare program administered by the Health Care Financing Administration of the Department of Health and Human Services, the Commonwealth under the Medicaid program, and certain managed care programs that govern payments to the Hospital for services rendered to patients covered by these programs. In addition, the Hospital is subject to revenue limitations imposed by statutes of the Commonwealth.

The following table shows the percentage distribution of gross patient service revenue by payor source for the five fiscal years ended September 28, 1991. The information provided was compiled from the Hospital's records.

	1987	1988	1989	1990	1991
Medicare	28.5%	27.4%	27.3%	28.8%	29.9%
Blue Cross	28.0	26.8	22.5	20.9	17.5
Medicaid	13.7	11.6	11.6	11.7	11.6
Self Pay	5.1	5.8	6.8	6.9	7.4
Commercial Insurance	13.9	12.6	14.2	14.2	12.4
Managed Care	7.7	11.3	14.1	15.6	19.3
Other	3.1	4.5	3.5	1.9	1.9
	100.0%	100.0%	100.0%	100.0%	100.0%

Source: Hospital records

Medicare

The Hospital and other Massachusetts acute care hospitals are paid for services to Medicare inpatients under the federal prospective payment system ("PPS") under which payments are based on standard national and regional amounts depending on the patient's diagnosis ("Diagnosis Related Group" or "DRG") and without regard to the hospital's actual inpatient operating costs. Hospitals also receive payment for both direct and indirect costs of medical education, capital related costs, and organ procurement costs. PPS permits additional payments, within specified limitations, to be made for atypical cases (outliers) and disproportionate share hospitals (hospitals with a larger than average population of patients subsidized by federal funds). Medicare outpatient services are generally reimbursed on a reasonable cost basis, subject to certain limitations and exceptions.

Until October 1, 1991, capital-related costs (including depreciation and interest on long-term debt) were reimbursed on the basis of Medicare's share of actual costs, less a certain specified percentage (15% in 1991).

Effective October 1, 1991, PPS incorporated inpatient capital costs. The method incorporating these costs provides for the following:

- The establishment of a federal capital rate which will be added to the DRG payment and adjusted for case mix, teaching costs, disproportionate share, large urban hospitals and geographical cost differences.

- A 10-year transition to the federal capital rate, with decreasing proportions of hospital-specific costs recognized over the 10-year transition period.

- A hospital specific component based on capital assets in service as of December 31, 1990, with certain exceptions.

- Different payment provisions for low capital cost hospitals and high capital cost hospitals, with the latter receiving 85% of their costs for old capital as defined by Medicare regulations.

Implementation of this new capital reimbursement methodology could result in Medicare capital payments that are less than the Hospital's actual capital costs attributable to Medicare patients.

Medicare graduate medical education ("GME") costs are reimbursed under a prospective methodology, which uses a hospital specific approved amount per resident determined based on each hospital's direct GME costs and its actual number of interns and residents during the base year beginning October 1, 1983. The base-year approved resident amount is inflated to the rate year by the Consumer Price Index and then multiplied by the hospital's rate year number of FTE residents weighted for the number of allowed years each resident has been in training. Medicare's share of the resulting amount is based upon the hospital's Medicare percentage of inpatient days in each year.

Additional payments are available to PPS teaching hospitals for the indirect medical education costs attributable to their approved graduate medical education programs (IME). The IME adjustment factor is applied to the federal portion of the prospective payment rate and total outlier payments. The Hospital's IME adjustment factor is currently approximately 7.7 percent for each 0.1 in the ratio of interns and residents to beds in use.

Payments for outpatient surgery are now based on the lowest of (1) reasonable cost, or (2) the hospital's customary charge for the service less 20%, or (3) a blended rate based on a combination of hospital reasonable costs and the rates paid to freestanding ambulatory surgery centers ("ASC") for the same service. Effective January 1, 1991, the blend is 42% hospital reasonable cost/58% ASC rate. Deductibles and a 20% coinsurance apply.

Medicare payments for outpatient hospital radiology services and certain other diagnostic procedures are based on the lowest of (1) reasonable cost, or (2) the hospital's customary charge for the service less 20%, or (3) a blended rate of reasonable costs and a percentage of prevailing charges in the locality for the same services furnished by physicians in their offices. The percentage of prevailing charges used for this calculation is 62% for radiology procedures and 42% for other diagnostic procedures. Effective January 1, 1991 the radiology blend is 42% hospital reasonable cost and 58% prevailing charges with the other diagnostic services blend at 50%/50%. Deductibles and a 20% coinsurance apply.

Routine clinical laboratory services are reimbursed at a rate of 62% of the prevailing charge. The remaining outpatient services are reimbursed at a rate which is the lower of cost or charges.

The Omnibus Budget Reconciliation Act of 1990 contains a number of provisions intended to reduce or contain Medicare expenditures for hospital services. These include mandated reductions below inflation for PPS payment updates and a 5.8% reduction in allowable outpatient costs.

Future actions by the federal government are expected to continue the trend toward more restrictive Medicare reimbursement for hospital services. The Hospital cannot assess or predict the ultimate effect of any such legislation or regulations, if enacted or adopted, on its operations.

Non-Medicare

From October 1, 1985 through September 30, 1991, payments for patient services by Blue Cross, Medicaid, commercial insurers, and other third party payors with the exception of Medicare were governed by a prospective payment system incorporated in a series of uniform agreements between each acute care hospital and Blue Cross (the "Master Contract") and by Chapter 372 of the Massachusetts Acts of 1982, as amended by Chapter 574 of the Acts of 1985 and Chapter 23 of the Acts of 1988 (collectively, the "Rate Setting Statutes"). Pursuant to the Rate Setting Statutes and authority granted by prior statute, the Massachusetts Rate Setting Commission (the "Commission") set a compliance limitation derived from the contractual provisions of the Master Contract on the maximum amount of non-Medicare gross inpatient service revenue that a hospital could generate each year. A hospital that exceeded its compliance limitation on non-Medicare gross inpatient service revenue was required to reduce its gross charges in the subsequent year to come into compliance with the established limitation. Various adjustments and exceptions to the allowable non-Medicare gross inpatient service revenue were subject to review and approval by the Commission.

Under the Rate Setting Statutes, commercial insurers paid generally at the level of established gross charges, Blue Cross paid at a discounted level from such gross charges, Medicaid paid at a level below such gross charges and managed care plans were free to negotiate individual arrangements. In addition, a statewide pool was established to fund uncompensated care, and each hospital's allowable revenues were adjusted to reflect the average statewide experience of hospitals in providing uncompensated care. The uncompensated care pool was funded by mandatory contributions from each hospital.

The Rate Setting Statutes and the Master Contract both expired on September 30, 1991. On December 31, 1991, the Massachusetts Legislature enacted a new hospital payment law, Chapter 495 of the Acts of 1991 ("Chapter 495"), which is retroactive to October 1, 1991. Chapter 495 represents a significant departure from hospital payment systems of the past decade and eliminates many prior regulatory controls over hospital charges.

Under the newly enacted law, hospitals and all third party payors are free to enter into individual contracts without Commission approval and, after a transition period, without other regulatory controls. During a two year transition period, hospitals will be subject to price caps and limitations on gross inpatient revenue. The price caps are established for each diagnostic related group of services ("DRGs") for all discharges from Massachusetts acute care hospitals. Chapter 495 prohibits a hospital from charging a narrow class of patients (patients who are not insured and who are not enrolled in a health care plan) more than a charge equal to the ninetieth percentile of charges assessed by other Massachusetts hospitals for the same DRG.

Chapter 495 also establishes a transitional overall hospital revenue cap known as the maximum gross inpatient service revenue limitation, which is determined by multiplying the total number of non-Medicare discharges in each DRG for each fiscal year times the appropriate price cap for each DRG and summing the results. If actual gross inpatient service revenues exceed this maximum revenue limitation, then the Commission will require a hospital to reduce its charges to effect compliance with the maximum revenue limitation. If at the end of 1993, a hospital's actual gross inpatient service revenue for the two year period exceeds its maximum revenue limitation, then the hospital must pay the net amount of the excess to the uncompensated care pool. Both the price caps and the overall revenue cap will cease to be in effect after September 30, 1993. Hospitals that overgenerated revenue under the prior reimbursement system must pay a portion of the excess into the uncompensated care pool over a period not to exceed five years.

Chapter 495 continues the uncompensated care pool in a modified form. Reimbursement for bad debts is no longer available from the pool, which will apply only to free care. For 1992, private sector liability to the pool is capped at $300 million. The amount of the cap may vary from year to year, and all Massachusetts acute care hospitals will share pro-rata in any liability attributable to free care expenditures in excess of the cap. Such liability, while not presently determinable, may be material. Pursuant to Chapter 495, Medicaid payments to a hospital by the Commonwealth may be offset by an amount equal to any unpaid liability of the Hospital to the uncompensated care pool.

Blue-Cross-Indemnity Plan

Following the expiration of the Master Contract on September 30, 1991, the Hospital was reimbursed by Blue Cross for services rendered to its indemnity plan subscribers under an interim arrangement which continued the rates in effect as of September 30, 1991. The Hospital has executed an Interim Agreement with Blue Cross for the period January 1, 1992 to March 1, 1992. The terms of the successor agreement are not currently known, although Blue Cross has indicated that it wishes the payment terms of such an agreement to apply retroactively to October 1, 1991. On January 10, 1992, Blue Cross forwarded to the hospital a lengthy proposal to begin the process of negotiating a successor agreement to the master contract. Failure to reach a satisfactory agreement with Blue Cross could have an adverse effect on the Hospital.

Medicaid

Under Title XIX of the Social Security Act, 42 U.S.C. Section 1396 et seq., the federal government supplements funds provided by the Commonwealth for medical assistance under the Medical Assistance Program ("Medicaid"). The Massachusetts Department of Public Welfare ("DPW") generally administers the Medicaid program in Massachusetts. Under Chapter 495, Medicaid rates are set by contracts between providers and DPW. Under the contract which the Hospital has signed with DPW, Medicaid pays for acute inpatient and outpatient services prospectively on a per discharge or per visit basis. The payment amount per discharge or per visit is a statewide average cost per discharge or per visit, adjusted by several factors including the case mix index and hospital specific capital costs and the higher labor costs of hospitals located in the Boston metropolitan area. In addition, teaching hospitals, such as the Hospital, receive additional payments for direct and indirect medical education. The per discharge or visit amount is established from 1990 cost data as submitted by all hospitals to the Commission. The Hospital has negotiated a separate per discharge payment for its pediatric cases based solely on the Hospital's 1990 pediatric cost data resulting in a significantly higher rate per pediatric discharge than the Hospital's rate per medical/surgical discharge.

In January, 1992, the DPW obtained a federal waiver that will allow it to require Medicaid beneficiaries to enroll in managed care programs. The Hospital is negotiating with DPW concerning its participation as a provider. Failure to reach agreement with DPW concerning such a managed care contract could have an adverse effect upon the Hospital.

Commercial Insurance

Commercial insurers have reimbursed their subscribers or made direct payment to hospitals on the basis of established hospital charges for covered services. Patients carrying such coverage are responsible to hospitals providing services for any deficiency between the amounts paid by the insurer and the charges for services rendered Under Chapter 495, commercial insurers are now free to negotiate contracts directly with hospitals, which could have an adverse effect on the Hospital.

Managed Care Programs

Payments to hospitals on behalf of subscribers of HMOs and PPOs are generally based on contracts negotiated between the hospitals and the HMO and PPO organization. Most of the Hospital's contracts provide for a negotiated per diem rate based on the type of service provided plus a discount from approved charges for certain ancillary services.

Deduction from Revenue

Cost reports are prepared annually for, and are subject to audit by the Medicare program by its fiscal intermediary, Blue Cross. Changes occur periodically in the regulations. When appropriate, accruals for estimated settlements with third-party payors in excess of estimates of the allowable non-Medicare gross inpatient service revenue determined pursuant to Chapter 495 are established against unresolved items. Upon resolution, any established but no longer necessary accruals are reversed, or amounts required in excess of accruals are expensed, and reflected in the Statement of Revenue and Expenses in the year of resolution in conformity with generally accepted accounting principles. The Hospital's management believes that adequate reserves for estimated settlements with third-party payors has been established based on information consistent with the current regulatory environment.

Reimbursement for Research

The principles for determining the allowability of costs and the procedures governing the reimbursement of such costs incurred in the conduct of hospital-based research are contained in a number of documents published by the federal government, private foundations and commercial organizations or are stipulated by the donors. In each of these documents, the sponsor defines the costs which are allowable and reimbursable and defines specific methods for making payments to the recipients of research grants and contracts.

Federal regulations, in principle, are designed to provide recognition of the full allocated costs of research, with no provision for profit or other increment above cost. In fact, medical center based research institutions, such as the Hospital, do not recover the full cost of research programs. This is primarily because certain types of expenses, such as interest and fund-raising costs, have not been reimbursable by the government. As a result, there remains an element of under-recovery which will continue as long as federal cost principles applicable to research at medical centers remain unchanged. (See "RESEARCH.")

The future funding of the Hospital's research program is dependent on the continued availability of funds from NIH and other public and private sources and the ability of the Hospital's investigators to compete successfully for those funds. Although in recent years funding of the Hospital's research programs has increased, there can be no assurance as to the adequacy of future funding of such research programs. Furthermore, federal legislation and policies to control the federal deficit, as well as other factors, could result in constraints on total research funding by NIH.

BONDOWNERS' RISKS AND MATTERS AFFECTING THE HEALTH CARE INDUSTRY

Future revenues and expenses will be affected by events and conditions relating generally to, among other things, demand for the Hospital's services, the ability of the Hospital to provide the services required by patients, physicians' relationships with the Hospital and its facilities, management capabilities, the design and success of the Hospital's strategic plans, economic developments in the Hospital's service area, the Hospital's ability to control expenses, competition, rates, costs, third-party reimbursement, legislation, and governmental regulation. Third party reimbursement and charge control statutes and regulations are likely to change, and unanticipated events and circumstances may occur which cause variations from the Hospital's expectations. The following general factors, among others, could affect the level of revenues to the Hospital or its financial condition or otherwise result in risks for Bondowners:

Legislative, Regulatory and Contractual Matters Affecting Revenues

The hospital industry is heavily regulated by federal and state governments, with a substantial portion of revenues coming from governmental sources. In the past there have been frequent and significant changes in the methods and standards used by government agencies to reimburse and to regulate the operation of hospitals. There is no reason to believe that substantial additional changes will not occur in the future. Legislation is periodically introduced in Congress and in the Massachusetts legislature which could result in limitations on hospital revenues, third-party payments and costs or charges or which could result in increased competition (e.g., Chapter 495) or an increase in the quantity of indigent care required to maintain the Hospital's tax-exempt status or could eliminate such status altogether regardless of the level of indigent care.

Government revenue sources are subject to statutory and regulatory changes, administrative rulings, interpretations of policy, determinations by fiscal intermediaries and government funding restrictions, all of which may materially increase or decrease the rates of payment and cash flow to hospitals. There is no assurance that payments made under such programs will remain at levels comparable to the present levels or be sufficient to cover all operating and fixed costs.

Restrictive payment policies at both the state and federal level have contributed to operating losses at many Massachusetts hospitals. In recent years, a number of hospitals in Massachusetts as well as in other states have closed or been converted to non-acute care facilities, and several Massachusetts hospitals have sought various forms of financial and administrative relief from the Commonwealth's Acute Hospital Conversion Board. A Massachusetts hospital recently was reorganized under the federal Bankruptcy Code.

The Hospital is subject to regulatory actions by those governmental or private agencies that administer the Medicare and Medicaid programs and by Blue Cross, the Commonwealth's Department of Public Health, the Commonwealth's Department of Public Welfare, the Commission, the Commonwealth's Department of Medical Security, the National Labor Relations Board, the Joint Commission on Accreditation of Healthcare Organizations, and other federal, state and local governmental agencies and private bodies. Actions of these organizations could adversely affect future operations of the Hospital. See "SOURCES OF PATIENT SERVICE REVENUE."

Increased Competition

It is likely that the Hospital will face increased competition in the future from other Boston teaching hospitals and other hospitals, from health maintenance organizations and from other forms of health care delivery that offer comparable health care services to the population which the Hospital presently serves. For example, St. Elizabeth's Hospital, Brigham and Women's Hospital and Massachusetts General Hospital have recently announced their intention to rebuild or expand obstetrical facilities. Changes in DON regulations that facilitate expansion may further enhance competition for patients among hospitals. Alternative delivery systems are expected to continue to account for an increasing percentage of the Hospital's admissions under contracts requiring discounts from charges or payment at negotiated rates. Moreover, other forms of competition may affect the Hospital's ability to maintain or improve its market share, including increasing competition (i) between physicians who generally use hospitals and non-physician practitioners such as nurse-midwives, nurse practitioners, chiropractors, physical and occupational therapists and others who may not generally use hospitals, and (ii) from nursing homes, home health agencies, ambulatory care facilities, surgical centers, rehabilitation and therapy centers, physician group practices, and other non-hospital providers of many services for which patients generally rely on hospitals currently.

Under Chapter 495 (see "SOURCES OF PATIENT SERVICE REVENUE"), Hospital management expects that competition among area hospitals will increase significantly as market share retention is expected to be essential to continued financial stability. Management believes that one of the most significant impacts of Chapter 495 for teaching hospitals such as NEMCH will be to reduce both Blue Cross indemnity plan patient volume (currently 18% for NEMCH) and the level of payment from Blue Cross for the remaining indemnity plan patient volume. Management expects that a material portion of its current Blue Cross indemnity patient volume will transfer to one or more managed care plans. The Hospital cannot predict whether it will be successful in negotiating favorable new contracts with Blue Cross or other third-party payers.

In recent years, specific actions have been taken by the Hospital to recruit and retain nursing and professional staff to strengthen certain clinical services and research activities. The Hospital has offered and in the future intends to offer competitive salaries to both newly recruited individuals and existing staff which in some years has exceeded, and in the future may continue to exceed, the rate of inflation. Such increases also have exceeded and in the future may exceed increases in the Hospital's rate of reimbursement.

The extent to which additional salary increases will be needed in the future, the effect of those additional increases on the financial condition of the Hospital, and the availability of qualified candidates for positions at the Hospital cannot be predicted. A renewal of past shortages of nurses and skilled technicians could have an adverse impact on payroll costs and could require the Hospital to limit admissions or reduce services.

Professional Malpractice Insurance Premiums

Professional malpractice litigation and insurance assessments and premiums paid by the Hospital and members of its medical staff could increase and could cause certain physicians to reduce the scope of their medical practice. Further, the Massachusetts Joint Underwriting Association has estimated a significant unfunded deficit, and hospitals, including NEMCH, may be assessed to fund any shortfall.

Limitations on Contractual Arrangements and Physician Recruitment

There are a variety of federal and state laws that affect a hospital's ability to enter into contractual arrangements. The Medicare and Medicaid anti-fraud and abuse statutes, and other laws, prohibit the payment of any remuneration, directly or indirectly, in cash or in kind, to encourage or induce physicians or other health care providers or suppliers to admit patients or order services or equipment. These laws include a spectrum of penalties and sanctions, including fines and possible exclusion from the Medicare and Medicaid programs. While regulations establishing certain limited "safe harbors" have been promulgated, in general there is no clear statutory, regulatory or administrative guidance concerning most contractual arrangements. Due to this uncertainty, there can be no assurance that all of the Hospital's contractual arrangements comply with the requirements of such statutes and regulations.

Further, there are financial incentives for the Hospital to recruit and retain active physicians who will admit patients and utilize the Hospital's services. The response of the Hospital to these incentives is limited, however, by legal restrictions, including limitations with respect to permitted activities of tax-exempt organizations and the Medicare and Medicaid anti-fraud and abuse statutes, which have been construed to apply to physician recruitment and joint venture activities. As a tax-exempt organization, the Hospital is limited with respect to its use of practice income guarantees, reduced rent on medical office space, low interest loans, joint venture programs, and other means of recruiting and retaining physicians. There can be no assurance that any existing financial arrangements with physicians comply with the requirements of applicable statutes and regulations.

Reimbursement for Uncompensated Care

The regulations promulgated by the Commonwealth's Department of Medical Security for administration of the uncompensated care pool (the "Pool") were intended, among other things, to limit the Pool's payments to hospitals for uncompensated care. These regulations were challenged in a lawsuit brought by the Massachusetts Hospital Association and have been overturned by a Massachusetts court. The court decision currently is being appealed by the Commonwealth. If the lower court decision is upheld, the Pool's liability for Hospital uncompensated care could increase and since the private sector's liability to the Pool is capped, any shortfall between the total costs of uncompensated care and the funds available from the Pool would be prorated across all hospitals in the Commonwealth. It is possible that this could in turn increase the Hospital's net liability to the Pool over historic levels. (See "SOURCES OF PATIENT SERVICE REVENUE.")

Other Risk Factors

In the future, the following additional factors, among others, may adversely affect the operations of health care providers, including the Hospital, to an extent that cannot be determined at this time:

- Increased unemployment or other adverse economic conditions in the Hospital's service area which might increase the proportion of patients without health insurance benefits or who are otherwise unable to pay fully for the costs of their care, or decrease the demand for the services of the Hospital as individuals delay or forego treatment because of inability to pay;
- Efforts by employers to reduce the costs of health insurance by having employees bear a greater portion of their health care costs causing employees to be more selective and cost-conscious in choosing healthcare services;
- Efforts by insurers and governmental agencies to reduce the utilization of hospital facilities and limit the cost of hospital services;

- Reduced demand for the services of the Hospital which might result from decreases, if any, in the population of the Hospital's service area;
- Reduced need for hospitalization or other services arising from medical and scientific advances;
- Increase in cost and limitation of availability of any insurance, such as malpractice, fire, automobile and general comprehensive liability, that hospitals of a size and type similar to the Hospital generally carry;
- Developments affecting the federal or state tax-exempt status of not-for-profit hospitals or of securities such as the Series F Bonds;
- Actions taken by the Commonwealth in response to approval by the voters in the November, 1990 general election of an initiative petition that mandates that no less than 40% of receipts from certain taxes be distributed to cities and towns as local aid funds, the effect of which would be to shift, commencing in fiscal 1992, significant Commonwealth revenues to local governments;
- Adoption of legislation establishing a national health program;
- Reductions or material changes in federal research funding (see "SOURCES OF PATIENT SERVICE REVENUE -- Reimbursement for Research"); and
- Construction of a new Central Artery in downtown Boston over the next decade, which may adversely affect access to the Hospital, particularly for elective and ambulatory services.

This letter and information contained herein are submitted to the Authority for inclusion in its Official Statement relating to its Revenue Bonds, New England Medical Center Hospitals Issue, Series F. The use of this letter by the Authority in connection with the initial sale and public offering of the Series F Bonds, and its execution and delivery by the President and Chief Executive Officer and by the Chief Financial Officer, have been duly authorized by the Board of Governors of New England Medical Center Hospitals, Inc.

NEW ENGLAND MEDICAL CENTER HOSPITALS, INC.

By: /s/Jerome H. Grossman, M.D.
President and Chief Executive Officer

By: /s/Dorothy E. Puhy
Chief Financial Officer

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REPORT OF INDEPENDENT ACCOUNTANTS

To the Board of Governors of
New England Medical Center Hospitals, Inc.:

We have audited the accompanying consolidated balance sheets of New England Medical Center Hospitals, Inc. as of September 28, 1991 and September 29, 1990, and the related consolidated statements of revenue and expenses, changes in net worth, and cash flows of general funds for the years then ended. These financial statements are the responsibility of the Hospitals' management. Our responsibility is to express an opinion on these financial statements based on our audits.

We conducted our audits in accordance with generally accepted auditing standards. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free of material misstatement. An audit includes examining, on a test basis, evidence supporting the amounts and disclosures in the financial statements. An audit also includes assessing the accounting principles used and significant estimates made by management, as well as evaluating the overall financial statement presentation. We believe that our audits provide a reasonable basis for our opinion.

In our opinion, the consolidated financial statements referred to above present fairly, in all material respects, the financial position of New England Medical Center Hospitals, Inc. at September 28, 1991 and September 29, 1990, and the results of its operations and its cash flows of general funds for the years then ended in conformity with generally accepted accounting principles.

Coopers & Lybrand

Boston, Massachusetts
November 20, 1991

NEW ENGLAND MEDICAL CENTER HOSPITALS, INC.

CONSOLIDATED BALANCE SHEETS, September 28, 1991 and September 29, 1990

(in thousands of dollars)

ASSETS	1991	1990
CURRENT ASSETS:		
Cash and equivalents	$ 2,504	$ 3,900
Current portion of assets whose use is limited (Notes C and E)	30,923	7,738
Patient accounts receivable - less allowance for uncollectible accounts: $23,000 and $17,100, respectively	52,528	36,189
Inventories	4,335	3,743
Prepaid expenses and other assets (Note I)	5,034	4,748
Total current assets	95,324	56,318
ASSETS WHOSE USE IS LIMITED:		
By Board for capital improvements (Note C)	66,766	66,233
By Board for designated purposes (Note C)	-	13,955
Professional and general liability (Notes C and G)	30,230	29,795
Under bond indenture agreements - held by trustees (Note E)	18,494	22,020
Total assets whose use is limited	115,490	132,003
PROPERTY, PLANT AND EQUIPMENT, net (Notes D and E)	160,105	145,667
OTHER ASSETS (Note H)	6,636	7,125
DONOR-RESTRICTED ASSETS:		
Cash	8,739	4,091
Investments (Note C)	41,848	40,110
Grants and contracts receivable	2,829	2,229
Other assets	1,439	864
Total donor-restricted assets	54,855	47,294
TOTAL	$432,410	$388,407

LIABILITIES AND NET WORTH	1991	1990
CURRENT LIABILITIES:		
Current portion of long-term debt and notes payable (Note E)	$ 4,535	$ 2,555
Accounts payable	14,383	8,233
Accrued expenses	20,710	17,257
Accrual for settlements with third-party payors (Note B)	35,583	37,395
Estimated professional and general liability (Note G)	6,489	5,144
Total current liabilities	81,700	70,584
LONG-TERM LIABILITIES:		
Accrual for settlements with third-party payors (Note B)	18,356	22,916
Estimated professional and general liability (Note G)	30,230	29,795
Other liabilities	3,450	1,983
Restricted liabilities	9,411	4,981
Long-term debt (Note E)	116,175	119,520
Total long-term liabilities	177,622	179,195
Total liabilities	259,322	249,779
COMMITMENTS AND CONTINGENCIES (Notes B, F, G and J)		
NET WORTH:		
General	127,644	96,315
Restricted:		
Specific Purpose	20,559	18,771
Plant Replacement and Expansion	6,173	5,719
Endowment	18,712	17,823
Net worth	173,088	138,628
TOTAL	$432,410	$388,407

The accompanying notes are an integral part of the consolidated financial statements.

NEW ENGLAND MEDICAL CENTER HOSPITALS, INC.

CONSOLIDATED STATEMENTS OF REVENUE AND EXPENSES

for the years ended September 28, 1991 and September 29, 1990

(in thousands of dollars)

	1991	1990
ATIENT SERVICE REVENUE (Note B)	$266,059	$224,892
REVENUE		
ect expenditures on grants, ontracts and other activities	23,005	21,359
overy of indirect costs on grants nd contracts	5,778	7,129
er revenue	14,521	13,196
Total other revenue	43,304	41,684
Total revenue	309,363	266,576
SES:		
aries and wages	119,451	106,484
nge benefits	19,660	17,348
vices of physician groups (Note I)	29,608	24,538
plies and expenses	71,870	62,436
reciation and amortization	17,662	14,404
erest	6,813	7,219
ect expenditures on grants, contracts nd other activities	23,005	21,359
vision for uncollectible accounts	12,086	7,863
Total expenses	300,155	261,651
E FROM OPERATIONS	9,208	4,925
ERATING GAINS (LOSSES):		
investment income	8,469	7,092
lized gain on investments	1,487	1,557
Total nonoperating gains	9,956	8,649
UE AND GAINS IN EXCESS OF EXPENSES LOSSES BEFORE EXTRAORDINARY GAIN	19,164	13,574
ORDINARY GAIN ON PRIOR EXTINGUISHMENT DEBT (NOTE E)	9,133	-
UE AND GAINS IN EXCESS OF EXPENSES LOSSES	$ 28,297	$ 13,574

The accompanying notes are an integral
part of the consolidated financial statements.

NEW ENGLAND MEDICAL CENTER HOSPITALS, INC.

CONSOLIDATED STATEMENTS OF CHANGES IN NET WORTH

for the years ended September 28, 1991 and September 29, 1990

(in thousands of dollars)

	GENERAL FUND	RESTRICTED FUNDS			TOTAL
		SPECIFIC PURPOSE	PLANT REPLACEMENT AND EXPANSION	ENDOWMENT	
BALANCES AT SEPTEMBER 30, 1989	$ 85,969	$ 16,983	$ 4,311	$ 16,799	$124,062
Revenue and gains in excess of expenses and losses	13,574				13,574
Net increase in valuation allowance on investments	(3,154)				(3,154)
Donor-restricted income:					
Investment income		2,557	359	16	2,932
Gifts, grants, awards and other restricted receipts		35,660		237	35,897
Net realized gains on investments (Note C)		178	85	771	1,034
Transfer from New England Medical Center, Inc.		299	965		1,264
Transfers and appropriations:					
Expenditures for designated purposes		(8,493)			(8,493)
Transfer to revenue for research and specific purposes		(28,488)			(28,488)
Transfer of funds	(74)	75	(1)		-
BALANCES AT SEPTEMBER 29, 1990	96,315	18,771	5,719	17,823	138,628
Revenue and gains in excess of expenses and losses	28,297				28,297
Net decrease in valuation allowance on investments	3,154				3,154
Donor-restricted income:					
Investment income		2,489	399		2,888
Gifts, grants, awards and other restricted receipts		37,716		236	37,952
Net realized gains on investments (Note C)		129	73	653	855
Transfer from New England Medical Center, Inc.		275			275
Transfers and appropriations:					
Expenditures for designated purposes		(10,178)			(10,178)
Transfer to revenue for research and specific purposes		(28,783)			(28,783)
Transfer of funds	(122)	140	(18)		-
BALANCES AT SEPTEMBER 28, 1991	$127,644	$ 20,559	$ 6,173	$ 18,712	$173,088

NEW ENGLAND MEDICAL CENTER HOSPITALS, INC.

CONSOLIDATED STATEMENTS OF CASH FLOWS OF GENERAL FUNDS

for the years ended September 28, 1991 and September 29, 1990

(in thousands of dollars)

	1991	1990
H FLOWS FROM OPERATING ACTIVITIES AND GAINS AND LOSSES:		
evenue and gains in excess of expenses and losses	$ 28,297	$ 13,574
djustments to reconcile revenue and gains in excess of expenses and losses to net cash provided by operating activities and gains and losses:		
Depreciation and amortization	17,662	14,404
Provision for uncollectible accounts	12,086	7,863
ncrease (decrease) in cash resulting from a change in:		
Patient accounts receivable	(28,425)	(12,052)
Inventories	(592)	(116)
Prepaid expenses and other assets	(286)	35
Other assets	291	(260)
Accounts payable	6,150	1,869
Accrued expenses	3,453	2,545
Settlements with third-party payors	(6,372)	19,805
Estimated professional and general insurance liability	1,780	7,900
Other liabilities	1,467	889
NET CASH PROVIDED BY OPERATING ACTIVITIES AND GAINS	35,511	56,456
H FLOWS FROM INVESTING ACTIVITIES:		
urchase of property, plant and equipment	(31,902)	(19,544)
ash invested in assets whose use is limited	(3,518)	(37,625)
ransfers and appropriations	(122)	(74)
NET CASH USED BY INVESTING ACTIVITIES	(35,542)	(57,243)
H FLOWS FROM FINANCING ACTIVITIES:		
epayment of long-term debt	(2,555)	(2,430)
orrowings from line of credit agreements	1,190	-
NET CASH USED BY FINANCING ACTIVITIES	(1,365)	(2,430)
INCREASE (DECREASE) IN CASH AND EQUIVALENTS	(1,396)	(3,217)
CASH AND EQUIVALENTS, BEGINNING OF YEAR	3,900	7,117
CASH AND EQUIVALENTS, END OF YEAR	$ 2,504	$ 3,900

The accompanying notes are an integral part of the consolidated financial statements.

NEW ENGLAND MEDICAL CENTER HOSPITALS, INC.

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

A. SIGNIFICANT ACCOUNTING POLICIES

General

The accompanying consolidated financial statements include New Englan Medical Center Hospitals, Inc. (NEMCH or the Hospital) including its 62.5% interest in New England Medical Center Insurance Company, LTD. (NEMCIC). All significant intercompany transactions have been eliminated.

Organization

New England Medical Center, Inc. (NEMC or the Medical Center) is the sole corporate member of the Hospital, NEMC Real Estate Company, Inc. Community Practice Program, Inc. (CPP) and NEMC Basic Research Corporation, Inc. It is also the majority owner of Transition System Inc. (TSI) and Liability Limited, Inc. (LL) and the sole stockholder New England Long Term Care, Inc (NELTC) (collectively, the Affiliates

Assets Whose Use is Limited

Assets whose use is limited include assets set aside by the Board of Governors for future capital improvements or other designated purpose and assets held by trustees under indenture agreements and self-insurance trust arrangements.

All funds are presented in an aggregate format which includes assets whose use is limited and donor-restricted funds. Donor-restricted funds are used to differentiate resources, the use of which is restricted by donors or grantors, from resources of general funds on which donors or grantors place no restriction or that arise as a resu of the operations of the Hospital for its stated purposes.

Net Patient Service Revenue

Net patient service revenue is reported at the estimated net realizab amounts from patients, third-party payors and others for services rendered.

A. SIGNIFICANT ACCOUNTING POLICIES, continued:

Third-Party Settlements

Under the terms of various agreements, regulations and statutes, certain elements of third-party reimbursement are subject to negotiation, audit and/or final determination by the third-party payors. The accompanying financial statements include certain estimates of final settlements. Variances between estimated and final settlements are included in the statements of revenue and expenses of general funds in the year in which the settlement or change in estimate occurs.

The Hospital has classified a portion of the accrual for settlements with third-party payors as long-term because such amounts, by their nature or by virtue of regulation or legislation, will not be paid within one year.

Free Care

The Hospital provides care to patients, who meet certain criteria under its free care policy, without charge. Because the Hospital does not pursue collection of amounts determined to qualify as free care, they are not reported as revenue. During 1991 and 1990, the Hospital provided approximately $10,640,000 and $9,215,000 in free care, respectively. Such amounts are determined using established rates.

Research Grants and Contracts

The Hospital engages in research activities funded by grants and contracts from U.S. Government agencies and other private sources. Revenues associated with grants and contracts are recognized as the related costs are incurred. Recoveries of indirect costs relating to certain government grants and contracts are reimbursed at fixed rates negotiated with the government agencies. Amounts reported in the accompanying statements of revenue and expenses of general funds as research relate to the direct and indirect costs of the research activity and the associated reimbursement of such costs.

Statements of Revenue and Expenses

For purposes of display, transactions deemed by management to be ongoing, major, or central to the provision of health care services are reported as revenue and expenses. Peripheral or incidental transactions are reported as gains and losses.

Cash and Equivalents

Cash and equivalents consist of cash and money market instruments with maturities of three months or less, excluding amounts whose use is limited by board designation or other arrangements under trust agreements.

A. SIGNIFICANT ACCOUNTING POLICIES, continued:

Investments and Investment Income

Investments are stated at the lower of aggregate cost (if received by gift or bequest, fair market value when received) or market value at the balance sheet date. Realized gains and losses on sales of investments are determined by use of the average cost method.

Investment income on proceeds of borrowings that are held by a trustee to the extent not capitalized, are reported as other revenue. Investment income from all other general fund investments and investment income of endowment funds are reported as nonoperating gains.

Certain Board Designated assets whose use is limited are classified as current assets because such funds are available to meet the Hospitals' working capital requirements.

Inventories

Inventories are stated at the lower of cost (determined on a first-in, first-out method) or market.

Property, Plant and Equipment

Property, plant, and equipment is stated at cost less accumulated depreciation. Depreciation is computed using the straight-line method over the estimated useful lives of depreciable assets.

Other Assets

Other assets consist of long-term receivables and deferred financing costs. Deferred financing costs are amortized over the period the related debt is outstanding.

Income Tax Status

NEMCH qualifies as a tax-exempt organization under Section 501(c)(3) of the Internal Revenue Code and accordingly, no provision for income taxes has been made in the accompanying financial statements.

Reclassifications

In 1991, the Hospital adopted the provisions of the American Institute of Certified Public Accountants Audit and Accounting Guide, "Audits of Providers of Health Care Services". Certain items in the consolidated financial statements for the year ended September 29, 1990 have been reclassified to conform to the 1991 presentation. While there were changes in detail revenue and expense classifications, the reclassification had no impact on the reported Revenue and Gains in Excess of Expenses and Losses or on Net Worth.

B. NET PATIENT SERVICE REVENUE

Third Party Reimbursement

The Hospital has agreements with Massachusetts Blue Cross, Inc., the Social Security Administration under the Medicare Program and the Commonwealth of Massachusetts under the Medicaid Program. These agreements provide for reimbursement to the Hospital for services rendered to patients covered by these programs based on the applicable reimbursement regulations and contracts. In addition, the Hospital is subject to statutes of the Commonwealth of Massachusetts that determine what the Hospital may charge for its patient services.

Maximum Allowable Cost (MAC) and Limits on Approved Revenue

Legislation enacted by the Commonwealth of Massachusetts on October 1, 1987, governs patient service revenue for all payors, except Medicare, through September 30, 1991. Successor legislation has not been enacted and the impact, if any, on Hospital operations cannot be determined. Maximum reimbursement levels have been established on the basis of maximum allowable costs (MAC), a prospective payment methodology, which represents the Hospitals' 1981 reimbursable patient care costs adjusted for changes in inflation, volume, certain exceptions, and mandated discounts.

Annual non-Medicare inpatient service revenue is limited to a maximum amount which is determined in the aggregate and subject to approval by the Massachusetts Rate Setting Commission (RSC). Differences between actual revenue and approved revenue results in an adjustment to non-Medicare gross inpatient service revenue in the succeeding year.

Prospective Payment System

The Hospital is subject to the federal prospective payment system (PPS) for Medicare inpatient services. Under PPS, Medicare pays a prospectively determined amount for all non-physician services provided for each inpatient discharge based upon the applicable "diagnosis-related group" (DRG) classification. Outpatient services are paid on a cost basis, subject to certain limits. Capital costs are paid on a cost pass-through basis, reduced by specific percentages as required by federal legislation.

Uncompensated Care Pool

The Commonwealth of Massachusetts operates an "Uncompensated Care Pool" (the Pool) which is funded by acute care hospitals. The Hospital has recognized its obligation to contribute to the Pool.

C. INVESTMENTS

Investments are either separately invested or included in pooled investme funds. Endowment funds and certain other designated funds are included i a pool which is operated on the "market-value" method whereby each participating fund is assigned a number of units based on the market valu of the assets of the pool at the time of entry of the funds into the pool Income earned on pooled investments is allocated to participating funds based on their respective shares of the pool. Other specific purpose fun are included in a pool which invests primarily in money market instrument Income is allocated to these funds based on fund balances.

Investments consist of the following (in thousands of dollars):

	1991		1990	
	Cost	Market Value	Cost	Market Value
Pooled:				
Cash and equivalents	$ 3,338	$ 3,338	$ 7,350	$ 7,350
Preferred and common stocks	23,501	28,850	15,578	20,351
Corporate debt and U.S. Government securities	102,207	106,143	98,531	96,567
Total	129,046	138,331	121,459	124,268
Separately invested:				
Cash and equivalents	2,876	2,876	7,506	7,506
Corporate debt and U.S. Government securities	54,793	56,231	48,389	48,830
Total	57,669	59,107	55,895	56,336
Accrued interest	1,546	1,546	2,497	2,497
Total investments	$188,261	$198,984	$179,851	$183,101

Investments are recorded in the balance sheet as follows (in thousands of dollars):

Current portion of assets use is limited	$ 30,923	$ 32,583	$ 7,738	$ 7,788
Assets whose use is limited:				
By Board for capital improvements	66,766	68,181	66,233	65,628
By Board for designated purposes	-	-	13,955	13,955
Professional and general liability	30,230	31,410	29,795	29,947
Under bond indenture agreements	18,494	18,569	22,020	22,231
Total	146,413	150,743	139,741	139,549

. INVESTMENTS, continued.

onor Restricted Assets

pecific purpose funds	18,076	19,523	17,720	18,274
lant replacement and expansion funds	5,143	5,611	4,690	5,033
ndowment funds	18,629	23,107	17,700	20,245
otal	41,848	48,241	40,110	43,552
otal investments	$188,261	$198,984	$179,851	$183,101

he excess of market value over cost of preferred and common stocks is the et of unrealized gains of $6,099,000 and $5,979,000, and unrealized losses f $750,000 and $1,206,000 at September 28, 1991 and September 29, 1990, espectively.

. PROPERTY, PLANT AND EQUIPMENT

roperty, plant and equipment consists of the following in thousands of dollars):

	1991	1990
and	$ 6,753	$ 6,309
uildings and improvements	168,843	163,168
quipment	68,151	55,613
otal	243,747	225,090
ess accumulated depreciation and amortization	102,955	89,079
otal	140,792	136,011
onstruction in progress	19,313	9,656
roperty, Plant and Equipment - net	$160,105	$145,667

nterest cost incurred on borrowed funds during the period of construction f capital assets, aggregating $976,000 and $232,000 in 1991 and 1990, espectively, is capitalized as a component of the cost of acquiring the ssets. Total interest paid by NEMCH exclusive of amounts capitalized, mounted to $8,508,000 and $8,185,000 in 1991 and 1990, respectively. urchases of property, plant and equipment aggregating $6,041,000 and 3,145,000 remained in accounts payable and accrued expenses at September 8, 1991 and September 29, 1990, respectively.

. LONG-TERM DEBT AND NOTES PAYABLE

ong term debt and notes payable consisted of the following (in thousands f dollars):

	1991	1990
ew England Medical Center Hospitals, Inc.:		
HEFA Series D Bonds	$ 79,170	$ 81,280
HEFA Series E Bonds	24,950	25,395
HEFA Series F Bonds	15,400	15,400
emand Line of Credit	1,190	-
otal	120,710	122,075
ess Current Portion	4,535	2,555
ong Term Debt	$116,175	$119,520

E. LONG-TERM DEBT AND NOTES PAYABLE, continued:

HEFA Series D Bonds

In October 1986, the Massachusetts Health and Educational Facilities Authority (the Authority or HEFA) issued tax-exempt HEFA Revenue Bonds, New England Medical Center Hospitals Issue, Series D (the Series D Bonds). The bonds have an effective average interest rate of 6.95% with a final maturity date of 2010. NEMCH established a debt service reserve fund, $7,949,000 at September 28, 1991, which is available under certain circumstances to pay Series D debt service. NEMCH has pledged as collateral, equally and ratably with the Series E and F bonds, substantially all its real and personal property and gross receipts. The agreement contains limitations on additional indebtedness and other covenants, none of which are considered to be of a restrictive nature to the Hospitals' business.

The proceeds of Series D Bonds ($88,795,000) were used to advance refund $53,315,000 and $30,385,000 of HEFA Series A and B Bonds (the Series A and B Bonds), respectively. The advance refunding was accomplished through an irrevocable trust, the assets of which were invested in Unite States Government obligations sufficient to refund the Series A and B Bonds on January 1, 1990 and August 1, 1993, respectively. Neither the refunding trust nor the Series A and B Bonds are included in the accompanying financial statements. At September 28, 1991, all of the Series A Bonds have been retired through the Trust. At September 28, 1991 and September 29, 1990, $28,075,000 and $28,610,000, respectively, of the Series B Bonds remain outstanding. During 1991, NEMCH determined the reimbursement it will receive from Medicare and other payors for the extraordinary loss on the extinguishment of debt recorded in 1986. NEMC has recognized the expected reimbursement amount as an extraordinary gain.

HEFA Series E Bonds

In August 1988, the Authority issued tax-exempt HEFA Revenue Bonds, New England Medical Center Hospitals Issue, Series E (the Series E Bonds) in the aggregate amount of $26,135,000. The bonds have an effective averag interest rate of 7.58% and a final maturity date of 2011. NEMC has pledged as collateral, equally and ratably with the Series D and F Bonds, substantially all its real and personal property and gross receipts. Th agreement contains limitations on additional indebtedness and other covenants, none of which are considered to be of a restrictive nature to Hospitals' business.

E. LONG-TERM DEBT AND NOTES PAYABLE, continued:

HEFA Series F Bonds

In January 1989, the Authority issued tax-exempt Periodic Auction Reset Securities (PARS) Series F (the Series F Bonds) in the aggregate amount of $145,500,000 of which NEMCH received proceeds of $15,400,000. The bonds have a fixed interest rate of 6.96% and a final maturity date of 2003. NEMCH established a debt service reserve funded by bond proceeds, $1,637,000 at September 28, 1991, which is available under certain circumstances to pay Series F debt service. The Series F Bonds are collateralized, equally and ratably with the Series D and E Bonds, by substantially all the Hospitals' real and personal property and gross receipts. The agreement contains limitations on additional indebtedness and other covenants, none of which are considered to be of a restrictive nature to the Hospitals' business.

Demand Line of Credit

In June, 1991 the Hospital entered into a $1.5 million Demand Line of Credit Agreement, (the Agreement). The Agreement is unsecured and bears interest at the bank's cost of funds rate plus .75% (6.4% at September 28, 1991).

Principal Payments

Annual principal payments on long-term debt over the next five fiscal years are summarized as follows (in thousands of dollars):

1992	$ 4,535
1993	3,915
1994	4,205
1995	4,510
1996	4,730
Thereafter	98,815
Total	$120,710

F. LEASES

NEMCH leases equipment and buildings under operating leases which expire at various dates through 1996. NEMCH's obligation under noncancelable leases at September 28, 1991 is as follows (in thousands of dollars):

	Total	Affiliates	Other
1992	$1,646	$1,366	$ 280
1993	1,636	1,366	270
1994	1,625	1,366	259
1995	206	-	206
1996	134	-	134
Total	$5,247	$4,098	$1,149

Rent expense under operating leases was approximately $1,621,000 and $1,125,000 in 1991 and 1990, respectively.

G. ESTIMATED PROFESSIONAL AND GENERAL LIABILITY

The Hospital has secured malpractice and general liability coverage with NEMCIC. NEMCIC is a captive insurance company owned jointly by NEMCH and its affiliated physician organizations. NEMCIC provides insurance coverage on a modified claims-made basis up to $2.5 million per insured defendant per claim, $5.0 million per insured defendant in the annual aggregate, up to $20 million in the annual aggregate for the Hospital. Excess liability insurance provides up to $50 million of coverage for any loss in excess of $5.0 million.

Premiums are prospectively assessed but subject to retrospective adjustment. The policy covers claims made during its term, but not those occurrences for which claims may be made after expiration of the policy. NEMCH intends to renew its coverage on a modified claims-made basis and has no reason to believe that it will be prevented from such renewal.

Premiums paid by NEMCH ($3,242,000 and $3,515,000 for the years ended September 28, 1991 and September 29, 1990, respectively) and the estimated professional and general liability are based upon estimates, prepared by NEMCIC's independent actuary, of the total discounted liability for reported and unreported professional and general liability claims. The estimated total liability is based upon the reporting pattern and unit costs of NEMCIC, up to $250,000 per claim, assuming a limit per occurrence of $10,000,000 in 1991 and 1990. Potential claim costs in excess of $250,000 per claim have been estimated based on industry data. The carrying amount of accrued reported and unreported claims was discounted at a rate of 7.0% in 1991 and 1990.

H. PENSION PLANS

NEMCH has a primary pension plan covering substantially all full-time employees who meet age and length of service requirements, and a secondary pension plan covering selected physicians. Total pension expense under these plans was $71,000 and $618,000 for the years ended September 28, 1991 and September 29, 1990, respectively. The primary plan is a defined benefit pension plan. Benefits are based on years of service and average compensation over the highest five consecutive years of service.

H. PENSION PLANS, continued:

Net periodic pension expense of the primary plan is comprised of the components listed below, as determined using the projected unit credit actuarial cost method. NEMCH's policy is to fund pension costs accrued. The plan's net periodic pension expense (income) for 1991 and 1990 is as follows (in thousands of dollars):

	1991	1990
Service cost for benefits earned during the period	$ 732	$ 689
Interest cost on projected benefit obligation	756	748
Actual return on plan assets.(gain) loss	(2,972)	1,698
Net amortization and deferral	1,382	(3,486)
Net periodic pension expense (income)	$ (102)	$ (351)

The following tables set forth the plans' funded status and obligations as of September 28, 1991 and September 29, 1990 (in thousands of dollars):

	1991	1990
Actuarial present value of accumulated plan benefits:		
Vested	$(13,675)	$(10,652)
Nonvested	(36)	(340)
Total	(13,711)	(10,992)
Effect of projected future compensation increases	(4,751)	(1,971)
Projected benefit obligation (PBO)	(18,462)	(12,963)
Fair market value of plan assets	22,089	17,801
Excess/(deficiency) of plan assets over/(under) PBO	3,627	4,838
Unrecognized transition asset	(3,113)	(3,539)
Unrecognized prior service cost	558	603
Unrecognized loss (gain)	3,079	2,147
Prepaid pension cost	$ 4,151	$ 4,049

In determining the projected benefit obligation for 1991 and 1990, NEMCH used an assumed weighted-average discount rate of 8.5% and a rate of increase in future compensation levels of 5.0%. The expected long-term rate of return on plan assets was 9.0% in 1991 and 1990. The unrecognized prior service cost results from amendments to the plan relating primarily to vesting and benefit formula changes. At September 28, 1991 and September 29, 1990, plan assets consisted of equity securities, corporate bonds and cash and equivalents.

I. AFFILIATES AND AFFILIATED ORGANIZATIONS

Affiliates

The Hospital provides various support services to its Affiliates. Revenue for these services, reported as other revenue in the accompanying financial statements, amounted to $455,000 and $850,000 for the years ended September 28, 1991 and September 29, 1990, respectively. NEMC Real Estate Company, Inc. rents property and provides utility services to the Hospital (see Note F). Rent and utility expense amounted to $1,569,000 and $981,000 for the years ended September 28, 1991 and September 29, 1990, respectively. Liability Limited provides claims management and other related services to the Hospital. Expenses for these services amounted to $313,000 and $309,000 for the years ended September 28, 1991 and September 29, 1990, respectively.

Amounts due (to) from Affiliates reported as prepaid expenses and other assets in the accompanying financial statements are as follows (in thousands of dollars):

	1991	1990
New England Medical Center, Inc	$ 419	$ 651
NEMC Real Estate Company, Inc	(33)	(26)
Community Practice Program, Inc	344	229
Transition Systems, Inc	75	313
Liability Limited, Inc	11	68
NEMC Basic Research Corporation, Inc	13	(3)
	$ 829	$1,232

Tufts-New England Medical Center, Inc.

Tufts-New England Medical Center, Inc. (T-NEMC) is a charitable corporation which provides services to NEMC and Affiliates and Tufts University (Tufts). The Governing Board of T-NEMC consists of equal representation from the Medical Center and Tufts. T-NEMC provides utility and other support services to the Hospital. Expenses for these services were approximately $4,341,000 and $4,263,000 for the years ended September 28, 1991 and September 29, 1990, respectively.

I. AFFILIATES AND AFFILIATED ORGANIZATIONS, continued:

Services of Physician Groups

Substantially all patient care, teaching and related administrative services are provided by medical staff through contractual arrangements with TMCA Foundation, Inc.(TMCA), Pratt Medical Group, Inc. (Pratt) and New England Medical Center Group Practice, Inc. (Group Practice). The Hospital is reimbursed by TMCA, Pratt and Group Practice for support services provided on their behalf. Transactions with the physician groups were as follows (in thousands of dollars):

	1991	1990
Professional services paid by NEMCH to:		
TMCA	$18,385	$18,033
Pratt	11,261	9,862
Group Practice	221	-
Support services reimbursed to NEMCH:		
TMCA	$ 3,257	$ 3,117
Pratt	1,231	1,186
Group Practice	107	-

Amounts due to (from) Affiliated Organizations, reported as accounts payable in the accompanying financial statements, are as follows (in thousands of dollars)

	1991	1990
T-NEMC	$ 561	$ 735
TMCA	161	300
Pratt	(44)	(118)
Group Practice	(15)	-
Total	$ 663	$ 917

J. COMMITMENTS AND CONTINGENCIES

The Hospital has commitments of approximately $13,613,000 remaining under construction contracts at September 28, 1991.

Various claims and legal actions are pending against NEMCH which have arisen in the normal course of business. In management's opinion, these proceedings, in the aggregate, are not expected to have a material effect on NEMCH's financial position or results of operations.

K. SUBSEQUENT EVENT

In November, 1991, fifteen specialty physician groups which comprise TMCA Foundation, Inc. formally declared their intention to withdraw from TMCA and form independent corporations effective in April, 1992. The new corporations will remain contractually committed to provide the Hospital services identical to those provided by TMCA.

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DEFINITIONS OF CERTAIN TERMS

In addition to terms defined elsewhere in this Official Statement, the following are definitions of certain terms used in this Official Statement and in the Mortgage and Trust Agreement dated as of September 2, 1986 (the "Mortgage and Trust Agreement") among the Authority, the Institution and The First National Bank of Boston, as Trustee (the "Series D Trustee"), as amended and supplemented by the First Supplemental Agreement dated as of August 2, 1988 (the "First Supplemental Agreement") among the Authority, the Institution and BayBank Middlesex (now BayBank), as trustee (the "Series E Trustee"), and the Second Supplemental Agreement dated as of January 7, 1992 (the "Second Supplemental Agreement"), among the Authority, the Institution and BayBank, as Trustee (the "Series F Trustee").

The following terms have the following meanings in the Mortgage and Trust Agreement, as amended and supplemented by the First Supplemental Agreement and the Second Supplemental Agreement, unless the context otherwise requires:

"Act" means Chapter 614 of the Massachusetts Acts of 1968, as amended from time to time.

"Agreement" means the Mortgage and Trust Agreement as amended and supplemented by the First Supplemental Agreement and the Second Supplemental Agreement.

"Alternative Indebtedness" means the Series E Bonds, the Series F Bonds, the Pool Loan and any other indebtedness of the Institution incurred in accordance with the Agreement, which is secured equally and ratably with the Bonds as to the lien on the Mortgaged Property under the Agreement and/or the lien on the Gross Receipts of the Institution under the Agreement.

"Authorized Officer" means: (i) in the case of the Authority, the Chairman, Vice Chairman, Secretary, Executive Director, Deputy Director or Assistant Executive Director and when used with reference to an act or document of the Authority also means any other person authorized to perform the act or execute the document; and (ii) in the case of the Institution, the Chairman or other presiding officer of the Board of Governors, the President, Director or other chief executive or administrative officer, any Vice President or Vice Chairman, the Treasurer or other chief financial officer or any Assistant Treasurer, and when used with reference to an act or document of the Institution, also means any other person authorized to perform the act or execute the document.

"Balloon Indebtedness" means long-term indebtedness which is either secured by a refinancing arrangement meeting the requirements of the Agreement or part of an issue of indebtedness 25% or more of the original principal amount of which has its Date of Maturity in the same 12 month period.

"Bondowners" means the registered owner of the Bonds from time to time as shown in the books kept by the Paying Agent as bond registrar and transfer agent.

"Bonds" means the $88,795,000 Massachusetts Health and Educational Facilities Authority Revenue Bonds, New England Medical Center Hospitals Issue, Series D, dated September 1, 1986 (the "Series D Bonds"), any additional Bonds issued under Section 501 of the Mortgage and Trust Agreement, and any Bond or Bonds duly issued in exchange or replacement therefor.

"Bond Insurance Policy" means the Municipal Bond New Issue Insurance Policy issued by the Bond Insurer that guarantees payment of principal of and interest on the Series F Bonds.

"Bond Insurer" means Financial Guaranty Insurance Company, a New York stock insurance company, or any successor thereto.

"Bond Insurer Event of Insolvency" means the occurrence and continuance of one or more of the following events: (i) the issuance, under the applicable laws of any state of the Untied States, of an order of rehabilitation, liquidation or dissolution of the Bond Insurer; (ii) the commencement by the Bond Insurer of a voluntary case or other proceeding seeking liquidation, reorganization or other relief with respect to itself or its debts under any bankruptcy, insolvency or other similar law now or hereafter in effect including, without limitation, the appointment of a trustee, receiver, liquidator, custodian or other similar official for itself or any substantial part of its property; (iii) the consent by the Bond Insurer to any relief referred to in the preceding clause (ii) in an involuntary case or other proceeding commenced against it; (iv) the making by the Bond Insurer of an assignment for the benefit of creditors; (v) the failure by the Bond Insurer to pay in general its debts as they become due; or (vi) the initiation by the Bond Insurer of any action to authorize any of the foregoing.

"Bond Year" means each one-year period (or shorter period from the date of issue of a series of Bonds) ending on June 30.

"Business Day" means a day on which banks in each of the cities in which the principal offices of the Trustee and the Paying Agent are located are not required or authorized to remain closed and on which the New York Stock Exchange is not closed.

"Date of Maturity" means as to any indebtedness of the Institution, as of any date of determination, the first date thereafter on which such indebtedness is payable, whether at maturity, by mandatory redemption (or purchase) or by redemption (or purchase) at the option of the holders; provided that if portions of any indebtedness are payable on different dates, the Date of Maturity shall be separately determined for each such portion. Balloon Indebtedness may be deemed to be payable as provided in the Mortgage and Trust Agreement in order to adjust actual Dates of Maturity for such indebtedness to assumed Dates of Maturity, to be used in calculating Total Principal and Interest Requirements.

"Gross Receipts" means all revenues and receipts of the Institution (other than gifts, grants or bequests which by their terms may not lawfully be used to fulfill the Institution's obligation to make payments under the Agreement) whether in the form of proceeds of accounts receivable or contract rights or otherwise.

"Hospital Consultant" means a nationally recognized firm of independent public accountants or hospital management consultants selected by the Institution and approved by the Authority.

"Insurer" means the Bond Insurer.

"IRC" means the Internal Revenue Code of 1986, as it may be amended and applied to each series of Bonds from time to time.

"Mortgaged Personalty" means the equipment and furnishings, not constituting fixtures, now or hereafter owned by the Institution, located at the premises described in Schedule A attached to the Mortgage and Trust Agreement, and used or useful in the operation of the facilities thereat, together with any additional personal property not included in the foregoing provisions which may be added to the Mortgaged Personalty by a supplemental agreement.

"Mortgaged Property" means the Mortgaged Personalty and the premises described in Schedule A attached to the Mortgage and Trust Agreement, all rights and easements appurtenant thereto and all buildings, structures, fixtures and improvements thereon, whether in existence on the date hereof or later coming into existence and whether owned by the Institution on the date hereof or acquired hereafter, together with any additional real property not included in the foregoing provisions which may be added to the Mortgaged Property by a supplemental agreement.

"Net Revenues Available for Debt Service" means the excess of revenues over expenses (excluding from revenues and expenses extraordinary items and excluding from expenses depreciation, interest on long-term indebtedness and amortization of bond discount and financing expenses), as determined in accordance with generally accepted accounting principles.

"Outstanding," when used to modify Bonds or Alternative Indebtedness refers to Bonds or Alternative Indebtedness issued under the Agreement, excluding: (i) Bonds or Alternative Indebtedness which have been exchanged or replaced, or delivered to the Trustee for credit against a principal payment or a sinking fund installment; (ii) Bonds or Alternative Indebtedness which have been paid; (iii) Bonds or Alternative Indebtedness which have become due and for the payment of which moneys have been duly provided; and (iv) Bonds or

Alternative Indebtedness for which there have been irrevocably set aside sufficient funds, or Government or Equivalent Obligations bearing interest at such rates and with such maturities as will provide sufficient funds, to pay or redeem them; provided, however, that if any such Bonds or Alternative Indebtedness are to be redeemed prior to maturity, the Authority shall have taken all action necessary to redeem such Bonds or Alternative Indebtedness and notice of such redemption shall have been duly mailed in accordance with the Agreement or irrevocable instructions so to mail shall have been given to the Trustee;

"Paying Agent" means the Paying Agent designated from time to time pursuant to Section 312 of the Mortgage and Trust Agreement.

"Pool Loan" means the Institution's loan from the proceeds of the Authority's Revenue Bonds, Capital Asset Program Issue, Series F in the initial principal amount of $15,400,000 which is qualified as Alternative Indebtedness under the Agreement.

"Revenues" means all rates, mortgage payments, rents, fees, charges, and other income and receipts, including proceeds of insurance, eminent domain and sale, and including proceeds derived from any security provided thereunder, payable to the Authority or the Trustee under the Agreement, excluding administrative fees of the Authority, fees of the Trustee, reimbursements to the Authority or the Trustee for expenses incurred by the Authority or the Trustee, and indemnification of the Authority and the Trustee.

"Series E Bonds" means the $26,135,000 Massachusetts Health and Educational Facilities Authority Revenue Bonds, New England Medical Center Hospitals Issue, Series E, and any bond or bonds duly issued in exchange or replacement therefor.

"Series F Bondowners" means the registered owners of the Series F Bonds from time to time as shown in the books kept by the Paying Agent as bond registrar and transfer agent.

"Series F Bonds" means the $113,745,000 Massachusetts Health and Educational Facilities Authority Revenue Bonds, New England Medical Center Hospitals Issue, Series F, dated February 1, 1992.

"Total Principal and Interest Requirements" means amounts required to amortize principal and to pay interest during a year on long-term indebtedness (reduced by the amount, if any, transferred or projected to be transferred during such year from the Excess Depreciation Fund pursuant to the Mortgage and Trust Agreement, by capitalized interest and by principal and interest paid from the proceeds of or investment earnings on amounts held in escrow therefor and excluding from long-term indebtedness any Hedging Contract) taking into account in determining the Total Principal and Interest Requirements for any future period that (i) at the election of the Institution, Balloon Indebtedness shall be deemed payable on the dates and in the amounts contemplated in the Agreement; (ii) principal on all indebtedness (including the Series D Bonds and Alternative Indebtedness) shall be deemed to be payable on the Date of Maturity thereof; and (iii) with respect to indebtedness refunded or refinanced during such period, the amounts of principal and interest taken into account during such period shall exclude amounts payable from proceeds of the refunding indebtedness. Computations of debt service on long-term indebtedness shall include an amount equal to twenty percent (20%) of the debt service on obligations of others for borrowed money guaranteed by the Institution, provided, however, that guaranties on a parity with the Series D Bonds and Alternative Indebtedness under the Agreement and guaranties of obligations with respect to which the Institution has made payments within the last twelve (12) months shall be included at one hundred percent (100%) of debt service. If any issue of additional Bonds, Alternative Indebtedness or other long-term indebtedness bears other than a fixed rate of interest, or contains one or more substantially disproportionate maturities (after treating sinking fund installments as if they were maturities), the Hospital Consultant or the Institution, as the case may be, may make such assumptions in determining the maximum Total Principal and Interest Requirements with respect to such indebtedness as it deems reasonable and as are acceptable to the Authority and if an event under "Maintenance of Corporate Existence" occurs, all jointly and severably liable entities shall be included in all computations or guaranties. Notwithstanding the preceding sentence, so long as the Series F Bonds are Outstanding, variable rate indebtedness shall be assumed to bear interest, for future periods and for all purposes of clause (c)(iii) under the heading "Additional Bonds" and clause (b)(iv) under the heading "Alternative Indebtedness", at a rate equal to the greatest of (i) the actual rate borne on the date of calculation by such variable rate indebtedness, or the projected initial rate if such variable rate indebtedness is not outstanding, (ii) the average rate borne during the twelve months preceding the date of calculation by such variable rate indebtedness, or, if such variable rate indebtedness has not been outstanding for twelve months and is computed by reference to an index, by outstanding variable rate debt for which the interest rate is determined by reference to the same or a comparable index, and (iii) 110% of the average Bond Buyer 25 Bond Revenue Index over the twelve months preceding the date of calculation.

"UCC" means the Massachusetts Uniform Commercial Code.

The following terms have the following meanings in the Second Supplemental Agreement unless the context otherwise requires:

"Cushion Ratio" means the total of cash, short-term investments and unrestricted and board-designated funds of the Institution, whether current or non-current (including debt service and reserve funds held by trustees for the Institution's debt), so long as such funds are not restricted to a use other than debt service by a person other than the Institution, as shown on the most recent audited financial statements of the Institution, divided by the maximum Total Principal and Interest Requirements for any future fiscal year.

"Government or Equivalent Obligations" means (i) obligations issued or fully and unconditionally guaranteed as to timely payment of principal and interest by the United States and to which the full faith and credit of the United States are pledged; (ii) certificates evidencing ownership of the right to the payment of the principal of or interest on obligations described in clause (i), provided that such obligations are held in the custody of a bank or trust company satisfactory to the Trustee or the Authority, as the case may be, in a special account separate from the general assets of such custodian; and (iii) tax exempt obligations of any state or instrumentality, agency or political subdivision thereof which are fully secured by, or payments as to principal and interest on which shall be made from, obligations described in (i) and which are rated AAA by S&P or Aaa by Moody's.

"Hedging Contract" means an interest rate exchange, cap or other agreement between the Institution and another party for the purpose of hedging payment, interest rate, spread or similar exposure.

"Moody's" means Moody's Investors Service, Inc. or a corporate successor.

"Opinion of Bond Counsel" means an opinion of Bond Counsel to the effect that the matter or action in question will not have an adverse impact on the tax-exempt status of the Bonds for federal income tax purposes.

"Paying Agent" means, with respect to the Series F Bonds, BayBank or its successor as appointed or designated by the Authority pursuant to the Agreement.

"S&P" means Standard & Poor's Corporation or a corporate successor.

"Series F Debt Service Reserve Fund Requirement" means an amount determined within 120 days after the end of each fiscal year of the Institution commencing with the fiscal year ending on the last Saturday of September 1992, which amount (a) shall be zero (0) so long as (i) the Net Revenues Available for Debt Service were equal to or greater than 1.50 times the Total Principal and Interest Requirements for the preceding fiscal year and (ii) the Cushion Ratio shall be equal to or greater than 1.75 as of the end of the preceding fiscal year as certified to the Trustee by an Authorized Officer of the Institution within 120 days after the end of the fiscal year or (b) if either such ratio is not met for the preceding fiscal year and until both such ratios are met in a future fiscal year shall be, on any date, the greatest amount required in the then current or any future Bond Year to pay the sum of: (i) interest on the Series F Bonds payable on January 1 of such Bond Year and on July 1 of the next succeeding Bond Year excluding accrued interest received upon the issuance of the Series F Bonds and capitalized interest financed by the issuance of the Series F Bonds; and (ii) the principal of the Series F Bonds or the sinking fund installment, as the case may be, payable on July 1 of the next succeeding Bond Year. For this purpose, principal becoming due by reason of acceleration or redemption (otherwise than from sinking fund installments) of Series F Bonds shall be treated as coming due on the originally scheduled dates until the same has been paid.

"Series F Project" means the acquisition of land, site development, construction or alteration of buildings or the acquisition or installation of furnishings and equipment, or any combination of the foregoing in connection with the following:

(a) Construction of an eight story building of approximately 218,327 gross square feet (the "1-C North Building"), located on the east side of Washington Street directly south of the existing Proger and Floating Hospital buildings, to house an emergency department, an expanded Operating Room/Day Surgery suite, and a variety of inpatient care activities. This portion of the Project also includes renovation of approximately 11,000 square feet of the adjacent Proger Building.

(b) Construction of an eight story building of approximately 158,000 gross square feet (the "1-C South Building"), located on the east side of Washington Street immediately to the south of the 1-C North Building, to house a variety of outpatient care activities.

(c) Renovations and equipment for outpatient clinic facilities in the Biewend Ambulatory Care Center and the Floating Hospital building.

(d) Replacement of Radiology facilities and equipment, including three Computerized Tomograph ("CT") Scanners.

(e) Replacement and upgrading of the sprinkler and fire alarm systems in the Pratt, Farnsworth, and Proger buildings.

(f) Renovations and equipment for the operating room suite, and for other existing inpatient facilities in the Proger and Floating Hospital buildings.

(g) Other renovations and equipment at the Institution's existing facilities.

The word "Series F Project" also refers to the facilities which result or have resulted from the foregoing activities. The scope of the Series F Project may be increased or decreased with the written consent of the Authority upon certification by the Series F Project Officer on behalf of the Institution describing the change, estimating the resulting increase or decrease in the cost of the Series F Project and stating: (A) that the amendment will not cause the Series F Project to violate any applicable building, zoning, land use, environmental protection, historical, sanitary, safety or health care laws, rules and regulations or applicable grant, reimbursement or insurance requirements or the provisions of the Agreement; (B) that the changes are covered by a Determination of Need (which shall mean a determination pursuant to Chapter 111, Section 25C, of the Massachusetts General Laws) or are exempt from the requirement of a Determination of Need; (C) with respect to any portion of the Project to which the amendment relates and for which a Determination of Need has been obtained, that the amendment is consistent with the Determination of Need and is not expected to increase its cost beyond the amount approved in the Determination of Need; (D) with respect to any portion of the Series F Project to which the amendment relates and which is exempt from the requirement of a Determination of Need, that the amendment is consistent with the exemption; and (E) as to any portion to which the amendment relates and which is exempt by reason of its cost being not more than the amount exempted by statute, that the amendment is not expected to increase its cost beyond that amount. The certificate shall also state whether it relates to construction or other work for which the Architect is responsible and, if so, it shall be confirmed by the signature of the Architect as to the items set forth in clause (A) above. The signers of the certificate may rely, as to conclusions of law, on an opinion of counsel furnished to the Authority and referred to in the certificate. The Authority may waive any provision required to be contained in the certificate or confirmed by the Architect upon advice of counsel that the waiver does not adversely affect the security for the Bonds and the Series F Bonds. The scope of the Series F Project may be increased only upon receipt by the Authority of an Opinion of Bond Counsel.

SUMMARY OF THE AGREEMENT

The following is a brief summary, prepared by Palmer & Dodge, Bond Counsel to the Authority, of certain provisions of the Agreement incorporating the Mortgage and Trust Agreement (M&TA), the First Supplemental Agreement (FSA) and the Second Supplemental Agreement (SSA) pertaining to the Series F Bonds and the Series F Project. This summary does not purport to be complete, and reference is made to the Agreement for full and complete statements of such and all provisions. **For additional amendments affecting the Series F Bonds, including a release of the lien upon the Mortgaged Property and the Gross Receipts, see Appendix C-3--"Summary of Future Amendments to the Agreement".**

The Agreement was entered into pursuant to a resolution adopted by the Authority on September 2, 1986, which authorized the issuance of the Series D Bonds in the principal amount of $88,795,000, and a resolution adopted by the Authority on January 7, 1992, which authorized the issuance of the Series F Bonds in the principal amount of $113,745,000.

The Mortgage and Trust Agreement permits the Series F Bonds to be secured equally and ratably with the Bonds and other Alternative Indebtedness as to the lien on the Mortgaged Property and the lien on the Gross Receipts of the Institution as "Alternative Indebtedness," with the written consent of the Authority, upon compliance with applicable conditions and the execution of a supplemental agreement among the Institution, the Authority, and the Trustee providing for the details of the Series F Bonds. The Second Supplemental Agreement constitutes the Authority's written consent to the Institution's securing the Series F Bonds as Alternative Indebtedness. (SSA Section 101)

Upon the receipt of the proceeds of the Series F Bonds, including accrued interest thereon, the Authority shall make payments from such proceeds as follows: (a) a sum equal to the accrued interest on the Series F Bonds shall be deposited in the Series F Debt Service Fund; (b) a sum equal to the interest on the portion of the Series F Bonds allocable to certain portions of the Series F Project from the date of delivery of the Series F Bonds to dates on or prior to the estimated completion dates of such portions of the Series F Project, as certified to the Trustee by the Institution, shall be deposited in the Capitalized Interest Account of the Series F Debt Service Fund; (c) amounts equal to the outstanding loans and advances being refinanced with Bond proceeds, as certified by an Authorized Officer of the Institution and approved by the Authority's Bond Counsel as eligible for financing hereunder, shall be used to pay off all or part of such loans and advances; (d) an amount not exceeding two percent (2%) of the proceeds of the Series F Bonds shall be deposited in the Series F Expense Fund; and (e) the balance of such proceeds shall be deposited in the Series F Construction Fund. (FSA Section 301)

Establishment of Funds

In conjunction with the issuance of the Series D Bonds, the following funds were established and maintained with the Trustee for the account of the Institution, to be held in trust by the Trustee and applied subject to the provisions of the Agreement:

Debt Service Fund;
Debt Service Reserve Fund;
Redemption Fund;
Excess Depreciation Fund; and
Rebate Fund.

Moneys in the Funds mentioned above are not pledged to or available for the payment of the Series F Bonds.

In conjunction with the issuance of the Series F Bonds, the following funds will be established and maintained with the Trustee for the account of the Institution, to be held in trust by the Trustee and applied subject to the provisions of the Second Supplemental Agreement:

Series F Debt Service Fund;
Series F Debt Service Reserve Fund;
Series F Redemption Fund; and
Rebate Fund.

In conjunction with the issuance of the Series F Bonds, the Series F Construction Fund and Series F Expense Fund will be established with the Authority to be held by the Authority in trust for the account of the Institution and applied subject to the provisions of the Second Supplemental Agreement.

For each series of tax-exempt bonds issued under the Agreement, the Trustee shall establish within the Rebate Fund a separate account. The Rebate Fund is not pledged as security to the Series F Bondowners. (M&TA Sections 303, 304, 305, 313, 315, 401, and 1009, SSA Sections 501, 502, 503, 504, 505 and 506)

Series F Construction Fund

The Authority shall apply moneys in the Series F Construction Fund to provide payments and reimbursements of Series F Project Costs. If all or a portion of the Series F Project cannot be completed because of failure to obtain necessary governmental approvals on terms acceptable to the Institution or if, upon completion of the Series F Project, any balance remains in the Series F Construction Fund not then needed to pay Series F Project Costs, the amount remaining shall be paid in the following order of priority: (i) to reimburse sums deposited in the Series F Construction Fund by the Institution other than any amounts derived from gifts, grants, or bequests received or expected to be received for the purposes of the Series F Project and any equity contribution required by a Determination of Need; and (ii) to the Series F Redemption Fund. (SSA Section 501)

Series F Debt Service Fund

The moneys and investments held in the Series F Debt Service Fund shall be held in trust and applied, except as otherwise provided, to the payment of the principal (including sinking fund installments), redemption premiums, if any, and interest on the Series F Bonds. The Trustee shall transfer moneys from the Series F Debt Service Fund to the Paying Agent for the payment of Series F Bonds. (SSA Section 502)

Series F Redemption Fund

The moneys and investments held in the Series F Redemption Fund shall be applied, except as otherwise provided, to the redemption of Series F Bonds. The Trustee may, and upon written direction of the Institution for specific purchases shall, apply moneys in the Series F Redemption Fund to the purchase of Series F Bonds for cancellation at prices not exceeding the price at which they are then redeemable (or next redeemable if they are not then redeemable), but not within the 45 days preceding a redemption date. Accrued interest on the purchase of Series F Bonds shall be paid from the Series F Debt Service Fund. Moneys in the Series F Redemption Fund to be applied to the redemption of Series F Bonds shall be transferred by the Trustee to the Paying Agent for payment.

If on any date the amount in the Series F Debt Service Fund is less than the amount then required to be transferred to the Paying Agent to pay the principal (including sinking fund installments) and interest then due on the Series F Bonds or if the amount in the Rebate Fund with respect to the Series F Bonds is less than the amount then required to be paid to the United States, the Trustee shall apply the amount in the Series F Redemption Fund (other than any sum irrevocably set aside for the redemption of particular Series F Bonds or required to purchase Series F Bonds under outstanding purchase contracts and after any required payment to the Rebate Fund with respect to the Series F Bonds) first, to the Rebate Fund, and second, to the Series F Debt Service Fund to the extent necessary to meet the deficiency. The Institution shall remain liable for any sums which it has not paid into the Series F Debt Service Fund or Rebate Fund, and any subsequent payment thereof shall be used to restore the funds so applied.

If any moneys in the Series F Redemption Fund are invested in accordance with the Agreement and a loss results therefrom so that there are insufficient funds to pay the redemption price of Series F Bonds called for redemption in accordance with the Second Supplemental Agreement, then the Institution shall immediately supply the deficiency. (SSA Section 503)

Rebate Fund

A Rebate Fund shall be established by the Trustee for the purpose of complying with Section 148(f) and the regulations thereunder (the "Rebate Provision") of the Internal Revenue Code of 1986, as amended (the "IRC"). For each series of tax-exempt bonds issued under the Agreement, the Trustee shall establish within the Rebate Fund a separate account. Amounts in the Rebate Fund shall not be available to pay principal, interest or redemption premium on Series F Bonds. Within forty-five (45) days after the close of each Bond Year (or applicable shorter period), the Institution shall compute and certify to the Authority and the Trustee in reasonable detail the amount payable to the Rebate Fund, if any, for such Bond Year and shall deposit such amount into the appropriate account of the Rebate Fund.

No later than sixty (60) days after the close of the fifth Bond Year (or applicable shorter period), and at least once in each five-year period thereafter, the Trustee shall pay from the Rebate Fund to the United States on behalf of the Authority the full amount then required to be paid under the Rebate Provision. Within sixty (60) days after the Series F Bonds are paid in full, the Trustee shall pay to the United States from the Rebate Fund or other funds provided by the Institution, on behalf of the Authority, the full amount then required to be paid under the Rebate Provision. If the amount in the Rebate Fund is insufficient to pay the amount required to be paid, the Institution shall be liable to make up that deficiency to the Trustee for deposit into the Rebate Fund prior to the Rebate Payment Date (as described below).

No later than fifteen (15) days prior to each date on which a payment could become due (a "Rebate Payment Date"), the Institution shall deliver to the Authority and the Trustee a certificate either summarizing the determination that no amount is required to be paid or specifying the amount then required to be paid pursuant to the Second Supplemental Agreement and, if an amount is required to be paid, the Trustee shall make such payment on the Rebate Payment Date from the Rebate Fund. (SSA Section 505)

Series F Expense Fund

The moneys and investments held in the Series F Expense Fund shall be held in trust and, except as otherwise provided in the Second Supplemental Agreement, shall be applied by the Authority solely to the payment or reimbursement of the costs of issuing the Series F Bonds. Earnings on the Series F Expense Fund shall not be applied to pay costs of issuance of the Series F Bonds but shall be transferred to the Series F Construction Fund pursuant to the Second Supplemental Agreement. If and to the extent that the Series F Expense Fund is insufficient to pay the costs of issuance, the Institution shall be liable for and pay the deficiency as directed by the Authority. (SSA Section 504)

Series F Debt Service Reserve Fund

The moneys in the Series F Debt Service Reserve Fund and any investments held as a part of such Fund shall be held in trust and, except as otherwise provided, shall be applied solely to the payment of principal (including sinking fund installments) of and premium, if any, and interest on the Bonds. When required to be funded, the Fund may be funded in whole or in part with cash, securities constituting Permitted Investments for the Fund or an irrevocable letter of credit or insurance policy reasonably acceptable to the Trustee and issued by an issuer whose long-term debt obligations or claims-paying ability, as applicable, is rated at least as highly as the Bonds are rated by S&P and Moody's and meeting certain other requirements set forth in the Agreement. Any letter of credit or insurance policy shall be in an amount which, together with any cash or securities in the Funds, shall equal the Series F Debt Service Reserve Fund Requirement, and available to be drawn on whenever the Agreement calls for the application of moneys in the Fund.

If on any date the amount in the Rebate Fund is less than the amount then required to be paid to the United States with respect to the Series F Bonds, the Trustee shall apply the amount in the Series F Debt Service Reserve Fund to the extent necessary to meet the deficiency. If on any date the amount in the Series F Debt Service Fund is less than the amount required to be transferred to the Paying Agent to pay the principal (including sinking fund installments) and interest then due on the Series F Bonds, the Trustee, after making all required payments to the Rebate Fund, shall apply the amount in the Series F Debt Service Reserve Fund to the extent necessary to meet the deficiency. The Institution shall remain liable for any required sums which it has not paid to the Rebate Fund or Series F Debt Service Fund and any subsequent payment thereof shall be used to restore the funds so applied.

If the amount in the Series F Debt Service Reserve Fund on July 1 or January 1 of any year (less any payment made therefrom on that day pursuant to the Agreement) exceeds the Series F Debt Service Reserve Fund Requirement, the Trustee shall transfer the excess to the Series F Debt Service Fund to be credited against payments otherwise required to be made thereto.

If and to the extent that the amount in the Series F Debt Service Reserve Fund on the one hundred and twentieth (120th) day after the end of any fiscal year of the Institution is less than the Series F Debt Service Reserve Fund Requirement, the Institution shall pay to the Trustee for deposit in the Series F Debt Service Reserve Fund on or before the fifteenth (15th) day of each month following such date, one-sixth (1/6) of the deficiency.

Investments in the Series F Debt Service Reserve Fund shall be valued at market, plus accrued interest where applicable. (SSA, Section 506)

Application of Moneys

If available moneys in the Series F Debt Service Fund after any required transfers from the Series F Debt Service Reserve Fund, the Series F Redemption Fund or the Excess Depreciation Fund are not sufficient on any day to pay all principal (including sinking fund installments), redemption price and interest on the Outstanding Series F Bonds then due or overdue, such moneys (other than any sum in the Series F Redemption Fund irrevocably set aside for the redemption of particular Series F Bonds or required to purchase Series F Bonds under outstanding purchase contracts and amounts required to be paid to the Rebate Fund with respect to the Series F Bonds) shall, after payment of all charges and disbursements of the Trustee in accordance with the Agreement, be applied (in the order such Funds are named in this paragraph) first to the payment of interest, including interest on overdue principal, in the order in which the same became due (pro rata with respect to interest which became due at the same time) and second to the payment of principal (including sinking fund installments) and redemption premiums, if any, without regard to the order in which the same became due (in proportion to the amounts due). For this purpose interest on overdue principal shall be treated as coming due on the first day of each month. Whenever moneys are to be applied pursuant to this paragraph, such moneys shall be applied at such times, and from time to time, as the Trustee in its discretion shall determine, having due regard to the amount of such moneys available for application and the likelihood of additional moneys becoming available for such application in the future. Whenever the Trustee shall exercise such discretion it shall fix the date (which shall be the first of a month unless the Trustee shall deem another date more suitable) upon which such application is to be made, and upon such date interest on the amounts of principal paid on such date shall cease to accrue. The Trustee shall give such notice as it may deem appropriate of the fixing of any such date. When interest or a portion of the principal is to be paid on an overdue

Series F Bond, the Trustee may require presentation of the Series F Bond for endorsement of the payment. (SSA Section 602)

Investments

Pending their use under the Agreement, moneys in the Series F Debt Service Fund, the Series F Redemption Fund and the portion of the Rebate Fund attributable to the Series F Bonds may be invested by the Trustee in Permitted Investments described under the definition of "Permitted Investments" below, maturing or redeemable at the option of the holder at or before the time when such moneys are expected to be needed and shall be so invested pursuant to written direction of the Institution if there is not then an Event of Default known to the Trustee. Moneys in the Series F Construction Fund and Series F Expense Fund may be invested by the Authority, at the direction of the Institution so long as no Event of Default known to the Authority then exists, in Permitted Investments maturing or redeemable at the option of the holder not late than the times when such moneys are expected to be needed. Moneys in the Series F Debt Service Reserve Fund may be invested by the Trustee in Permitted Investments of a type customarily sold in a recognized market and shall be so invested pursuant to written direction of the Institution if there is not then an Event of Default know to the Trustee; provided that at least one-half (1/2) of the amount held in such Fund shall consist of cash and obligations maturing or redeemable at the option of the holder within ten (10) years and the remainder within twenty (20) years. Any investments pursuant to this paragraph shall be held by the Trustee or the Authority, as the case may be, as a part of the applicable Fund and shall be sold or redeemed to the extent necessary to make payments or transfers or anticipated payments or transfers from such Fund, subject to the notice provisions of Section 9-504(3) of the Uniform Commercial Code to the extent applicable.

Except as set forth below, any interest realized on investments in any Fund and any profit realized upon the sale or other disposition thereof shall be credited to the Fund with respect to which they were earned and any loss shall be charged thereto. Earnings (which for this purpose include net profit and are after deduction of net loss) on accrued interest and capitalized interest deposited in the Series F Debt Service Fund and earnings on the Series F Expense Fund shall be transferred to the Series F Construction Fund not less often than quarterly. Earnings (which for this purpose include net profit and are after deduction of net loss) on the Series F Debt Service Reserve Fund during the construction period shall be transferred to the Series F Construction Fund not less often than quarterly. Earnings on the Series F Debt Service Reserve Fund after the construction period shall be transferred to the Series F Debt Service Fund and credited against payments otherwise required to be made thereto not less often than quarterly; provided, however, that earnings on the Series F Debt Service Reserve Fund shall be retained in the Fund to the extent necessary to make the amount therein equal to the Debt Service Reserve Fund Requirement. Earnings on the Series F Redemption Fund shall be transferred to the Series F Debt Service Fund and credited against the payments otherwise required to be made thereto.

The term "Permitted Investments" means (i) Government or Equivalent Obligations, (ii) "tax exempt bonds" as defined in IRC §150(a)(6), other than "specified private activity bonds" as defined in IRC §57(a)(5)(C), which are direct obligations of any state of the United States of America or any subdivision or agency thereof whose unsecured, uninsured and unguaranteed general obligation debt is rated, at any time of purchase, "A" or better by Moody's and "A" or better by S&P, or any obligation fully and unconditionally guaranteed by any state, subdivision or agency whose unsecured, uninsured and unguaranteed general obligation debt is rated, at the time of purchase, "A" or better by Moody's and "A" or better by S&P, respectively, at the time of acquisition thereof or shares of a so-called money market or mutual fund that do not constitute "investment property" within the meaning of IRC §148(b)(2), provided either that the fund has all of its assets invested in such obligations of such rating quality or, if such obligations are not so rated, that the fund has comparable creditworthiness through insurance or otherwise and which fund is rated Aam or Aam-G if rated by S&P; (iii) Federal funds, unsecured certificates of deposit, time deposits or bankers acceptances (in each case having maturities of not more than 365 days) of any domestic bank including a branch office of a foreign bank which branch office is located in the United States, provided legal opinions are received to the effect that full and timely payment of such deposit or similar obligation is enforceable against the principal office or any branch of such bank, which, at the time of purchase, has a short-term "Bank

Deposit" rating of "P-1" by Moody's and a "Short-Term CD" rating of "A-1" or better by S&P; (iv) deposits of any bank or savings and loan association which has combined capital, surplus and undivided profits of not less than $3 million, provided such deposits are continuously and fully insured by the Bank Insurance Fund or the Savings Association Insurance Fund of the Federal Deposit Insurance Corporation; (v) Repurchase Agreements; (vi) money market funds which have a rating of AAAm-G or AAAm; (vii) direct obligations and fully guaranteed certificates of beneficial interest of the Export-Import Bank of the United States; consolidated debt obligations and letter of credit-backed issues of the Federal Home Loan Banks; participation certificates and senior debt obligations of the Federal Home Loan Mortgage Corporation; debentures of the Federal Housing Administration; mortgage-backed securities (except stripped mortgage securities which are valued greater than par on the portion of unpaid principal) and senior debt obligations of the Federal National Mortgage Association; participation certificates of the General Services Administration; guaranteed mortgaged-backed securities and guaranteed participation certificates of the Government National Mortgage Association; guaranteed participation certificates and guaranteed pool certificates of the Small Business Administration; debt obligations and letter of credit-backed issues of the Student Loan Marketing Association; local authority bonds of the U.S. Department of Housing & Urban Development; guaranteed Title XI financings of the U.S. Maritime Administration; guaranteed transit bonds of the Washington Metropolitan Area Transit Authority; Resolution Funding Corporation securities; (viii) commercial paper (having original maturities of not more than 270 days) which is rated at the time of purchase P-1 by Moody's and A-1 or better by S&P; and (ix) shares of any open-end or closed-end management type investment company or trust registered under 15 U.S.C. §80 (a)-1 et seg., provided that the portfolio of such investment company or trust is limited to cash, Government or Equivalent Obligations and repurchase agreements fully collateralized by Government or Equivalent Obligations and provided further that such investment company or trust shall take custody of such collateral either directly or through a custodian satisfactory to the Trustee or the Authority. The term "Repurchase Agreement" shall mean a written agreement under which a bank or trust company insured by the Federal Deposit Insurance Corporation or a government bond dealer reporting to, trading with, and recognized as a primary dealer by the Federal Reserve Bank of New York and subject to the jurisdiction of the Securities Investors' Protection Corporation (provided that such bank or dealer has an uninsured, unsecured, unguaranteed obligation rated P-1 or A-3 or better by Moody's and A-1 or A- or better by S&P) sells to, and agrees to repurchase from the Authority or the Trustee obligations issued or guaranteed by the United States; provided that the market value of such obligations is at the time of entering into the agreement at least one hundred and three percent (103%) of the repurchase price specified in the agreement and that (i) such obligations are held free and clear of any lien by the Authority or the Trustee, as the case may be, or an independent third party acting solely as agent (the "Agent") for the Trustee or the Authority, and such third party is (A) a Federal Reserve Bank, (B) a bank which is a member of the Federal Deposit Insurance Corporation and which has combined capital , surplus and undivided profits of not less than $50 million or (C) a bank approved in writing for such purpose by the Bond Insurer, and the Authority or the Trustee shall have received written confirmation from such third party that it holds such securities, free and clear of any lien, as agent for the Authority or the Trustee; and (ii) a perfected first security interest under the Uniform Commercial Code, or book entry procedures prescribed at 31 C.F.R. 306.1 et seq. or 31 C.F.R. 350.0 et seq. in such securities is created for the benefit of the Authority or the Trustee, as the case may be; and (iii) the repurchase agreement has a term of 180 days or less, and the Trustee or the Agent will value the collateral securities no less frequently than weekly and will liquidate the collateral securities if any deficiency in the required collateral percentage is not restored within two business days of such valuation. Any such investments may be purchased from or through the Trustee. (M&TA Section 311 and SSA Section 701)

Payments by the Institution

The Institution shall pay to the Trustee for deposit in the Series F Debt Service Fund, not later than the June 15 or December 15 next preceding each date on which a payment of principal, premium, if any, or interest is due on the Series F Bonds, an aggregate amount of funds necessary to make all such payments on the Series F Bonds in full on such date and shall pay on or before December 15 of each year one-half of the principal coming due on the following July 1.

The payments to be made under the foregoing paragraph shall be appropriately adjusted to reflect the date of issue of Series F Bonds, any accrued and capitalized interest deposited in the Series F Debt Service Fund, and any purchase or redemption of Series F Bonds so that there will be available on each payment date in the Series F Debt Service Fund the amount necessary to pay the interest and principal or sinking fund installment due or coming due on the Series F Bonds and so that accrued interest will be applied to the installments of interest to which they are applicable.

At any time when any principal (including sinking fund installments) of the Series F Bonds is overdue, the Institution shall also have a continuing obligation to pay to the Trustee for deposit in the Series F Debt Service Fund an amount equal to interest on the overdue principal but the installment payments required as described above shall not otherwise bear interest. Redemption premiums shall not bear interest.

As additional security for its obligations to make various payments to the Series F Debt Service Fund and the Rebate Fund and on the Bonds and Alternative Indebtedness including its obligation to restore amounts transferred from the Series F Redemption Fund or the Excess Depreciation Fund to the Series F Debt Service Fund or from other funds established for Bonds or Alternative Indebtedness to pay debt service on the Bonds and Alternative Indebtedness, the Institution grants to the Authority a security interest in its Gross Receipts and upon any rights to receive such Gross Receipts. If any required payment is not made when due, any Gross Receipts with respect to which this security interest remains perfected pursuant to law (including the Act) shall be transferred or paid over immediately to the Trustee without being commingled with other funds (unless already so commingled) and any Gross Receipts thereafter received shall upon receipt be transferred to the Trustee in the form received (with necessary endorsements) to the extent necessary to cure the deficiency. The Institution represents and warrants that the lien granted by this paragraph is and at all times will be a first lien, subject only to Permitted Encumbrances.

> Gross Receipts paid by the Institution to other parties in the ordinary course might no longer be subject to the lien of the Agreement and might therefore be unavailable to the Authority. The enforcement of this lien on Gross Receipts and receivables is also subject to the exercise of discretion by a court of equity which, under certain circumstances, may have power to direct the use thereof to meet expenses of the Institution before paying debt service. In the event of the bankruptcy of the Institution, any receivables coming into existence and any Gross Receipts received, on or after the date which is 90 days (or, in some circumstances, one year) prior to the commencement of the case in bankruptcy court, might not, pursuant to Sections 547 and 552 of the Bankruptcy Code, Title 11 of the United States Code, be subject to the lien of the Authority. With respect to receivables and Gross Receipts not subject to the lien, the Authority would occupy the position of an unsecured creditor.

Payments by the Institution to the Trustee for deposit in the Series F Debt Service Fund under the Second Supplemental Agreement shall discharge the obligation of the Institution to the extent of such payments; provided, that if any moneys are invested in accordance with the Agreement and a loss results therefrom so that there are insufficient funds to pay principal (including sinking fund installments) and interest on the Series F Bonds when due, the Institution shall promptly supply the deficiency.

The Institution shall pay the Authority's annual administrative fee. Within thirty (30) days after notice, the Institution shall also pay expenditures reasonably incurred by the Authority, the Trustee or the Paying Agent by reason of the Agreement. (M&TA Sections 308 and 703, SSA Section 601)

The Bond Insurer

The Bond Insurer shall be deemed to be the owner of the Series F Bonds for purposes of giving consents (including consent to amendments to the Agreement other than those requiring unanimous consent of the affected Bondowners as described under the heading "Amendments" below) notices, directions and waivers to the Institution, the Authority and the Trustee under the Agreement.

The provisions contained under this heading and all other rights and remedies granted to the Bond Insurer under the Agreement shall be null and void upon the happening of any of the following: (i) a Bond Insurer Event of Insolvency, except to the extent of payments made by the Bond Insurer under the Bond Insurance Policy which are not voidable preferences; or (2) continuing failure of the Bond Insurer to pay in accordance with the Bond Insurance Policy. (Section 707).

Additional Bonds

(a) The Authority may issue additional Bonds to provide additional moneys for the Debt Service Reserve Fund established for the benefit of the owners of the Series D Bonds (the "Series D Debt Service Reserve Fund"), to refund Bonds previously issued, or to finance or refinance any other project or projects of the Institution permitted under the Act, provided that the additional project is located or to be located on the Mortgaged Property.

(b) Prior to the delivery of any additional Bonds, the Institution, the Authority and the Trustee shall enter into a supplemental agreement providing for the details of the additional Bonds, including the application of the proceeds thereof substantially in accordance with the provisions of the Agreement relating to the initial Bonds. The supplemental agreement shall require payments by the Institution at such times and in such manner as shall be necessary to provide for full payment of the debt service on the additional Bonds as it becomes due. The supplemental agreement may also amend any other provision of the Agreement, provided that it will not have a material adverse effect upon the security for the Bonds other than that implicit in the authorization of parity Bonds.

(c) No additional Bonds shall be delivered by the Trustee (except to provide additional moneys for the Series D Debt Service Reserve Fund or to refund Bonds) unless no Event of Default under the Agreement shall exist and there shall be filed with the Authority and the Trustee:

> (i) A certificate of an architect acceptable to the Authority setting forth (A) the estimated cost of the project being financed or refinanced with the proceeds of the additional Bonds, (B) the estimated amounts which will be required from month to month to pay such cost, and (C) the estimated date of completion of such project;
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> (ii) An opinion of a nationally recognized firm of independent public accountants acceptable to the Authority showing that Net Revenues Available for Debt Service for the preceding fiscal year of the Institution or for any twelve (12) consecutive calendar months ending not more than one hundred eighty (180) days prior to the issuance of the additional Bonds equal at least 1.20 times the maximum Total Principal and Interest Requirements; and
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> (iii) A written report by a Hospital Consultant that the estimated Net Revenues Available for Debt Service during the first two (2) full fiscal years of operation of the facilities to be financed by the additional Bonds or the first two (2) full fiscal years after a refinancing, if the facilities being refinanced are already in use and operation, are not expected to be less than 1.25 times the maximum Total Principal and Interest Requirements for Bonds (including the additional Bonds), Alternative Indebtedness and other long-term indebtedness for those or any subsequent fiscal year during which Bonds will be Outstanding. The written report by a Hospital Consultant shall not be required, however, if (i) the principal amount of additional Bonds to be issued and all other additional Bonds issued under this clause within the preceding two (2)

years does not exceed ten percent (10%) of the Institution's unrestricted fund balance as shown in its most recent audited financial statements or (ii) a written report by the Institution shows that Net Revenues Available for Debt Service for each of the two preceding fiscal years of the Institution were at least 1.40 times the maximum Total Principal and Interest Requirements for Bonds (including the additional Bonds), Alternative Indebtedness and other long-term indebtedness for that or any subsequent fiscal year during which Bonds or Alternative Indebtedness will be Outstanding.

(d) If the Institution is unable to satisfy the requirements of clauses (c)(ii) or (c)(iii) above, or of clauses (b)(iii) or (iv) under the section on "Alternative Indebtedness" below, such otherwise unmet requirements shall be deemed satisfied if there shall be filed with the Authority and the Trustee a report by a Hospital Consultant containing the following opinions:

(i) Applicable laws and regulations have prevented or will prevent generation of the required level of Net Revenues Available for Debt Service, and, if requested by the Authority, an accompanying opinion of counsel setting forth any conclusions of law relevant to such opinion;

(ii) With regard to a failure to satisfy the requirements of clause (c)(ii), or clause (b)(iii) under the section on "Alternative Indebtedness" below, the Institution generated Net Revenues Available for Debt Service which could reasonably be generated given such governing laws and regulations during the applicable period and that the Net Revenues Available for Debt Service for the period equal at least 1.00 times the Total Principal and Interest Requirements for the period; and

(iii) That, with regard to a failure to satisfy the requirements of clause (c)(iii), or clause (b)(iv) under the section on "Alternative Indebtedness" below, based upon forecasts and estimates contained in the report, the Institution will generate the maximum amount of Net Revenues Available for Debt Service which can reasonably be generated given such governing laws and regulations during the applicable period and that the estimated Net Revenues Available for Debt Service for the applicable period are not expected to be less than 1.00 times the maximum Total Principal and Interest Requirements for Bonds and Alternative Indebtedness (including the additional Bonds or proposed Alternative Indebtedness) and other long-term indebtedness for those or any subsequent fiscal year during which Bonds or Alternative Indebtedness will be Outstanding.

(e) The interest on the additional Bonds shall be payable semi-annually on January 1 and July 1 of each year. The principal payments or sinking fund installments shall be payable on July 1 of each year. No additional Bonds shall be delivered unless the amount on deposit in the Debt Service Reserve Fund for Bonds shall at least equal the Debt Service Reserve Fund Requirement immediately after the delivery of the additional Bonds. (M&TA Section 501)

Alternative Indebtedness

The Institution may incur Alternative Indebtedness to finance or refinance any capital project or projects of the Institution or guarantee the indebtedness of others on a parity basis with the Bonds and Alternative Indebtedness (provided that the indebtedness guaranteed, if issued directly by the Institution, could be issued as Alternative Indebtedness), but in each case only with the written consent of the Authority, which consent shall not be unreasonably withheld after considering the interests of the owners of the Bonds and Alternative Indebtedness.

Consent of the Authority to the incurring of Alternative Indebtedness by the Institution may be given upon the fulfillment of the following conditions:

(a) The Institution and the Alternative Indebtedness lender or lenders (the "Alternative Lender") shall have entered into a written agreement satisfactory to the Authority and an executed counterpart of such agreement shall have been delivered to the Authority and the Trustee;

(b) No Event of Default under the Agreement shall exist and there shall have been filed with the Authority and the Trustee:

(i) An opinion of nationally recognized bond counsel satisfactory to the Authority that the agreement between the Institution and the Alternative Lender and any supplement to the Agreement in connection therewith are permitted by the Agreement and that the creation of security interests in the Mortgaged Property and Gross Receipts of the Institution for the benefit of the holders of Alternative Indebtedness is permitted by law and will not materially adversely affect (other than as implicit in the authorization of parity debt) the rights of the Bondowners and the holders of Alternative Indebtedness to realize upon their share of the security interests in the Mortgaged Property and Gross Receipts of the Institution;

(ii) A certificate of an architect acceptable to the Authority containing (A) the estimated costs of the project to be financed or refinanced with the proceeds of the Alternative Indebtedness, (B) the estimated amounts which will be required from month to month for paying such cost, (C) the estimated date of completion of such project, and (D) a statement that, in his or her opinion, the proceeds of the Alternative Indebtedness together with other available moneys, as represented by the Institution, are not less than the total cost of such project. Where the project or a portion of the project is one for which plans and specifications have not been prepared by an architect, or with the consent of the Authority, a certificate of an Authorized Officer of the Institution may be substituted;

(iii) Subject to the provisions of clause (d) of the section on "Additional Bonds" summarized above, an opinion of a nationally recognized firm of independent public accountants acceptable to the Authority showing that Net Revenues Available for Debt Service for the preceding fiscal year of the Institution or for any twelve (12) consecutive calendar months ending not more than one hundred eighty (180) days prior to the delivery or incurring of such Alternative Indebtedness equal at least 1.30 times the maximum Total Principal and Interest Requirements for the same period;

(iv) Subject to the provisions of clause (d) of the section on "Additional Bonds" summarized above, a written report by a Hospital Consultant that the estimated Net Revenues Available for Debt Service during each of the first two (2) full fiscal years of operation of the facilities to be financed by such Alternative Indebtedness or the first two (2) full fiscal years after a refinancing, if the facilities being refinanced are already in use and operation, are not expected to be less than 1.30 times the maximum Total Principal and Interest Requirements for Bonds, Alternative Indebtedness (including the proposed Alternative Indebtedness) and other long-term indebtedness for those or any subsequent fiscal year during which Bonds or Alternative Indebtedness will be Outstanding. The written report by a Hospital Consultant shall not be required, however, if (A) the principal amount of Alternative Indebtedness to be issued and all other Alternative Indebtedness issued under this clause (A) within the preceding two (2) years does not exceed ten percent (10%) of the Institution's unrestricted fund balance as shown in its most recent audited financial statements or (B) a written report by the Institution shows that Net Revenues Available for Debt Service for each of the two preceding fiscal years of the Institution were at least 1.40 times the maximum Total Principal and Interest Requirements for Bonds, Alternative Indebtedness (including the proposed Alternative Indebtedness) and other long-term indebtedness for those or any subsequent fiscal year during which Bonds or Alternative Indebtedness will be Outstanding; and

(v) A certificate of an Authorized Officer of the Institution stating (i) that, in the estimation of the Institution, after the issuance of the Alternative Indebtedness the fair market value of the Mortgaged Property, including any real property added to the Mortgaged Property in connection with the issue of the Alternative Indebtedness will not be less than the principal amount of Bonds Outstanding and the outstanding Alternative Indebtedness, and (ii) that the Institution has made such investigation and consulted such experts as it deemed necessary to arrive at a reasonable estimate of the fair market value of the Mortgaged Property; and

(c) The Agreement shall have been amended to provide that the lien on the Gross Receipts of the Institution secures the obligation of the Institution to make payments of principal of, premium, if any, and interest on the Alternative Indebtedness in addition to the payments and obligations described in the Agreement.

In addition to the Mortgaged Property and Gross Receipts of the Institution, future Alternative Indebtedness may be secured by a pledge, lien, mortgage, security interest or other encumbrance on any tangible or intangible property of the Institution other than money or other property on deposit in the funds established to secure Bonds and Alternative Indebtedness or, except as provided in the Agreement, in the Excess Depreciation Fund.

Unless waived in writing by the Authority, the agreement between the Institution and the Alternative Lender shall contain the following provisions:

(1) Any pledge, lien, mortgage, security interest or other encumbrance on any tangible or intangible property of the Institution granted to secure Alternative Indebtedness shall be extended also to secure the obligations of the Institution under the Agreement equally and ratably with such Alternative Indebtedness;

(2) Payments by the Institution shall be required at such times and in such manner as shall be necessary to provide for full payment of the debt service on the Alternative Indebtedness as it becomes due in substantially equal annual amounts of principal or in substantially equal annual amounts of principal and interest combined and to provide for payment of any other cost in connection therewith;

(3) The Alternative Lender and the trustee, if any, appointed to administer such Alternative Indebtedness (the "Alternative Indebtedness Trustee") shall notify the Authority, the Series F Trustee and the Institution of any default in a payment by the Institution with respect to debt service on the Alternative Indebtedness immediately upon becoming aware of such default; and

(4) The recovery and application of insurance and eminent domain proceeds, the entry, operation and sale of the Mortgaged Property by the Authority, the exercise of the rights and remedies of the Authority as a secured party, the institution of legal proceedings by the Authority or the Series D Trustee, and the exercise of the rights of the Authority to perform the Institution's obligations with respect to the Mortgaged Property, all as provided in the Agreement, shall be the sole and exclusive remedies of the Alternative Lender and the Alternative Indebtedness Trustee (in the event of a default or breach by the Institution under the agreement between the Institution and the Alternative Lender) with respect to the lien on the Mortgaged Property and Gross Receipts. However, the agreement between the Institution and the Alternative Lender may set forth additional remedies which the Alternative Lender or the Alternative Indebtedness Trustee may exercise with respect to the Mortgaged Property and Gross Receipts upon obtaining the written consent of the Authority.

The agreement between the Institution and the Alternative Lender shall set forth the specific terms of allocation between the Bonds and Alternative Indebtedness (based on the levels of outstanding indebtedness of Bonds and Alternative Indebtedness from time to time, which may include interest to the extent permitted by such agreement) of any net proceeds derived from the exercise of the rights and remedies of the Authority or the Series D Trustee under the Agreement and/or of any net proceeds derived from the exercise of the rights and remedies of the Alternative Lender and the Alternative Indebtedness Trustee, if any, under the agreement between the Institution and the Alternative Lender.

The parties may enter into a supplemental agreement amending the Agreement to provide for the incurring of Alternative Indebtedness by the Institution in accordance with the provisions of this section. Such a supplemental agreement may provide, among other things, for notices from the holders of Alternative Indebtedness or from the Alternative Indebtedness Trustee to the Series F Trustee and/or the Authority regarding defaults by the Institution, the duties and limitations of duties of the Trustee and/or the Authority to pursue remedies upon the receipt of such notice, and the sharing of the rights of the Bondowners to control the exercise of remedies with the holders of Alternative Indebtedness. Such supplemental agreement may modify the Agreement to the extent necessary to reflect the intended participation of the Alternative Indebtedness in the Excess Depreciation Fund maintained under the Agreement on an equal and ratable basis with the Bonds. (M&TA Section 502)

Default

"Event of Default" means any one of the events set forth below and "default" means any Event of Default without regard to any lapse of time or notice.

(a) Debt Service. The Institution shall fail to make debt service payments required under the Agreement within seven (7) days after the same become due and payable.

(b) Other Obligations. The Institution shall fail to make any other required payment to the Trustee, and such failure is not remedied within seven (7) days after written notice or the Institution shall fail to perform its obligations under the insurance or licensure provisions of the Agreement, and such failure is not remedied within seven (7) days after written notice thereof is given by the Authority or the Trustee to the Institution; or the Institution shall fail to observe or perform any of its other agreements, covenants or obligations under the Agreement and such failure is not remedied within sixty (60) days after written notice.

(c) Warranties. There shall be a material breach of warranty made in the Agreement by the Institution as of the date it was intended to be effective and the breach is not cured within sixty (60) days after written notice from the Authority or the Trustee to the Institution.

(d) Voluntary Bankruptcy. The Institution shall commence a voluntary case under the federal bankruptcy laws, or shall become insolvent or unable to pay its debts as they become due, or shall make an assignment for the benefit of creditors, or shall apply for, consent to or acquiesce in the appointment of, or taking possession by, a trustee, receiver, custodian or similar agent for itself or any substantial part of its property.

(e) Appointment of Receiver. A trustee, receiver, custodian, or similar agent shall be appointed for the Institution or for any substantial part of its property and shall not be discharged within sixty (60) days.

(f) Involuntary Bankruptcy. The Institution shall have an order or decree for relief in an involuntary case under the federal bankruptcy laws entered against it, or a petition seeking reorganization, readjustment, arrangement, composition or other similar relief as to it under the federal bankruptcy laws or any similar law for the relief of debtors shall be brought against it and shall be consented to by it or shall remain undismissed or unstayed for sixty (60) days.

(g) Breach of Other Agreements. A breach shall occur (and continue beyond any applicable grace period) with respect to a payment by the Institution of debt service on Alternative Indebtedness (irrespective of the amount borrowed) or with respect to the payment of other indebtedness of the Institution for borrowed money with respect to loans in the aggregate exceeding one-half of one percent (0.50%) of the Institution's unrestricted fund balances, or with respect to the performance of any agreement securing such Alternative Indebtedness or such other indebtedness of the Institution or pursuant to which the same was issued or incurred, or an event shall occur with respect to provisions of any such agreement relating to matters of the character referred to in this paragraph, so that a holder or holders of such indebtedness or a trustee or trustees under any such agreement accelerates or is empowered to accelerate any such indebtedness; but an Event of Default shall not be deemed to be in existence or to be continuing under this clause (g) if (i) the Institution is in good faith contesting the existence of such breach or event and if such acceleration is being stayed by judicial proceedings or (ii) such breach or event is remedied and the acceleration, if any, is wholly annulled. Immediately upon becoming aware of such breach or event the Institution will notify the Trustee and the Authority.

If the Trustee determines that a default has been cured before the entry of any final judgment or decree with respect to it, the Trustee may waive the default and its consequences, including any acceleration, with the written consent of the Authority, by written notice to the Institution and shall do so, with the written consent of the Authority, upon written instruction of the owners of at least twenty-five percent (25%) in principal amount of the Outstanding Bonds and Series E and F Bonds. (M&TA Section 601, SSA Sections 704 and 706)

Remedies for Events of Default

If an Event of Default occurs and is continuing:

(a) Acceleration. The Series D Trustee may (but only with the written consent of the Bond Insurer as to the Series F Bonds) by written notice to the Institution and the Authority declare immediately due and payable the principal of the Outstanding Bonds and Series E and F Bonds and the payments to be made by the Institution therefor, and accrued interest on the foregoing.

(b) Entry. The Authority may at any time enter the Mortgaged Property, may take complete and peaceful possession of the Mortgaged Property, in whole or in part, with or without process of law, may dispossess the Institution therefrom, upon the giving of notice as set forth in the Agreement, and may operate and manage the Property in the name of the Institution or otherwise.

(c) Power of Sale. The Authority shall also have the statutory power of sale and, with or without an entry, may sell the Mortgaged Property or any part or parts of the same, upon the giving of notice as set forth in the Agreement.

(d) Rights as a Secured Party. The Authority may exercise all of the rights and remedies of a secured party under the Massachusetts Uniform Commercial Code (the "UCC") with respect to that portion of the Mortgaged Property which is or may be treated as collateral under the UCC.

(e) Rights as to Gross Receipts. The Authority may exercise all of the rights and remedies of a secured party, under the UCC or otherwise, with respect to the lien on Gross Receipts created by the Agreement. (M&TA Section 602, SSA Section 704)

Remedies Cumulative

The rights and remedies under the Agreement shall be cumulative and shall not exclude any other rights and remedies allowed by law, provided there is no duplication of recovery. (M&TA Section 606)

Limitations on Bondowners' Remedies

The Authority and the Trustee may be directed to act by the owners of the Bonds, the Series E Bonds and the Series F Bonds as provided in this paragraph. Upon a failure of the Institution to make a required debt service payment within seven (7) days after the same becomes due and payable, the Trustee shall give written notice of such default to the Authority and the Institution. Except as provided above, the Trustee shall not be required to take notice of any other breach or default by the Institution or the Authority, and the Authority shall not be required to take notice of a breach or default by the Institution, in each case unless given written notice thereof by the owners of at least ten percent (10%) in principal amount of the Outstanding Bonds, the Series E Bonds and the Series F Bonds. The Trustee shall give default notices and accelerate payments, and the Authority shall give default notices, in each case when so instructed in writing by the owners of at least twenty-five percent (25%) in principal amount of the Outstanding Bonds, the Series E Bonds and the Series F Bonds. The Trustee shall institute legal proceedings to enforce the obligations of the Authority and the Authority shall institute legal proceedings to enforce the obligations of the Institution under the Agreement, in each case in accordance with the written directions of the owners of a majority in principal amount of the Outstanding Bonds, the Series E Bonds and the Series F Bonds.

Neither the Trustee nor the Authority shall be required to take any remedial action (other than acceleration or the giving of notice), unless reasonable indemnity is furnished for any expense or liability to be incurred therein.

No owner of the Bonds, the Series E Bonds or the Series F Bonds shall have any right to institute any legal proceedings for the enforcement of the obligations of the Authority or the Institution under the Agreement, unless the Authority and the Trustee have failed or refused to take action as required by the Agreement. Subject to the foregoing, any owner of Bonds, the Series E Bonds or Series F Bonds may by any available legal proceedings enforce and protect its rights under the Agreement and the laws of Massachusetts. (M&TA Sections 702, 802, 902, SSA Section 706)

Covenant as to Operation

The Institution shall do nothing which would adversely affect its exemption from federal income taxes. The Institution shall not take or permit any action which would cause the Series F Bonds to be "arbitrage bonds" under Section 148 of the IRC or to cease to be "qualified 501(c)(3) bonds" under Section 145 of the IRC. (M&TA Section 1002, SSA Section 1003)

Maintenance of Corporate Existence

The Institution shall maintain its existence as a nonprofit corporation qualified to do business in Massachusetts and shall not dissolve or dispose of or spin off all or substantially all of its assets, or consolidate with or merge into another entity or entities, or permit one or more other entities to consolidate with or merge into it, except upon satisfaction of the conditions set forth in the Agreement which include (a) that each of the surviving or resulting entity or entities meet certain requirements set forth in the Agreement as to its nonprofit, tax-exempt status, (b) that the transaction not result in a conflict, breach or default as referred to in the Agreement, (c) that the surviving, resulting or transferee entity or entities each assumes by written notice to the Authority and the Trustee all the obligations of the Institution under the Agreement, and (d) that the Institution or transferee or surviving or resulting entity or entities shall either obtain the consent of the Authority or submit to the Authority a written report of a nationally recognized firm of independent public accountants showing (i) that on a consolidated pro forma basis for its most recent fiscal year based upon the audited financial statements of the Institution as certified by independent public accountants or on a consolidated pro forma basis for any surviving or resulting entity or entities as certified by independent public accountants, the ratio of Net Revenues Available for Debt Service to the maximum Total Principal and Interest Requirements for Bonds and Alternative Indebtedness and other long-term indebtedness for that or any subsequent fiscal year during which Bonds or Alternative Indebtedness will be Outstanding is at least 1.50 and that such transaction will not lower the ratio for the Institution or transferee or surviving or resulting entity or entities by more than thirty percent (30%) from what it would have been for the Institution without the transaction or (ii) that such pro forma ratio is greater than the ratio for the Institution would have been without the transaction. The Institution may substitute for the accountants' report referred to in the preceding sentence a written report by a Hospital Consultant showing that the estimated Net Revenues Available for Debt Service for the first full fiscal year after the transaction will meet the same tests. No such written reports shall be required if the assets acquired as a result of all such mergers or consolidations in any fiscal year of the Institution are less than three percent (3%) of its net land, buildings and equipment, as shown in its most recent audited financial statements. (M&TA Section 1006)

Insurance

The Institution (i) shall insure its plant, equipment and furnishings (including the Mortgaged Property) against fire, lightning and extended coverage perils and against such other risks as are customarily insured against by similar institutions in the area, in an amount at least equal to eighty percent (80%) of the insurable value thereof, exclusive of excavations and foundations, or, in the case of blanket policies, an amount at least equal to the outstanding long-term indebtedness of the Institution (as determined in accordance with generally accepted accounting principles), including Bonds and Alternative Indebtedness, but in any case not less than the amount necessary to avoid coinsurance; (ii) shall carry workers' compensation insurance, disability insurance and other insurance concerning employee life and health, to the extent required by law; (iii) shall maintain insurance against liability of the Institution for certain injuries to persons (other than from professional malpractice), and for death of persons from such injuries, in the minimum amount of $1,500,000 per person and $1,500,000 per occurrence and for damages to property in the minimum amount of $1,500,000 per occurrence; and (iv) shall maintain insurance against liability of the Institution for professional malpractice in the minimum amount of $1,500,000 per claim or occurrence and $7,500,000 in the aggregate per policy year. Any such policy may exclude an amount of loss equal to one-half of one percent (0.5%) of the value of the Institution's land, buildings and equipment, net of accumulated depreciation, as reflected in the Institution's most recent audited financial statements so that the Institution is its own insurer to that extent. Substitutions for or omissions from the required coverage may be made with the consent of the Authority. Without limiting the generality of the foregoing, the Authority may consent to self-insurance or other risk management programs, including pooled insurance programs or so-called captive off-shore insurance companies, and may take account of legal limitations on potential liability. If the Mortgaged Property is in a flood hazard district, the Institution shall also maintain flood hazard insurance to the extent required by 42 U.S.C. §4012a. (M&TA Section 404)

Rate Covenant

The Institution agrees, subject to any limitations imposed by law, to charge and collect rates and charges which, together with any other moneys legally available to it, shall provide moneys sufficient at all times: (a) to make the payments required by the Agreement and comply with the Agreement in all other respects, and (b) to satisfy all other obligations of the Institution in a timely fashion. Without limiting the generality of the foregoing, the Institution shall, subject to applicable governmental restrictions, charge and collect rates and charges which in each fiscal year will produce revenues at least sufficient to meet expenses (excluding from revenues and expenses extraordinary items and excluding from expenses depreciation but including interest on and amortization of long-term indebtedness). Within one hundred twenty (120) days after the end of each fiscal year, the Institution shall furnish to the Trustee and the Authority a letter from its auditors confirming that the requirement of the foregoing sentence was met during the fiscal year and setting forth for the fiscal year the Net Revenues Available for Debt Service and the maximum Total Principal and Interest Requirements on existing indebtedness during the fiscal year or in any future year. If the Net Revenues Available for Debt Service were not at least 1.20 times such maximum Total Principal and Interest Requirements, the Institution shall employ a Hospital Consultant to make recommendations as to rates and charges and other aspects of hospital management and operation. Copies of the report of the Hospital Consultant shall be filed with the Trustee and the Authority. The Institution shall, subject to applicable governmental restrictions, contracts, third party payors, its fiduciary obligations and other restrictions and limitations on its legal authority, revise its rates and charges and other aspects of its management and operation in conformity with the recommendations or file with the Authority and the Trustee its reasons for not following the recommendations. The Institution shall thereafter achieve a ratio of Net Revenues Available for Debt Service to Total Principal and Interest Requirements of at least 1.20 unless the Institution is following the recommendations of the Hospital Consultant and the ratio actually achieved is at least 1.00. (M&TA Section 1004)

Encumbrance, Sale and Lease of Property; Borrowings

Encumbrance, Sale and Lease of Property. The Institution may grant purchase money security interests on equipment and furnishings, transfer all or substantially all of its assets pursuant to the Agreement, make sales of equipment, furnishings and fixtures which have become obsolete, worn out, or unnecessary for the operation of the Institution, and assign accounts receivable (subject to the lien of the Agreement to secure indebtedness permitted by "Borrowings" below). Except with respect to Permitted Encumbrances, the Institution shall not, without the consent of the Authority, encumber its title to any of its property to secure indebtedness, or lease any of the Mortgaged Property or any of its real property to others; provided, however, that in accordance with the Agreement, the consent of the Authority is not required in the event the Institution encumbers its title to vacant land which is part of the Mortgaged Property. In any event, the Institution shall not encumber its title to any of its property to secure indebtedness or lease the same to others or sell or dispose of the same (other than in the ordinary course of operations consistent with and incidental to the Institution's charitable purposes and except as permitted by this paragraph or by the Agreement) in any one fiscal year except property with a net book value not in excess of three percent (3%) of the total assets of the Institution, as shown on its most recent audited financial statements, unless (1) with respect to the Mortgaged Property, (i) the Authority has consented to such encumbrance, lease, or disposition and, with respect to any sale or disposition, and either (ii) the Institution submits a written appraisal by an appraiser satisfactory to the Authority showing that the proceeds of any disposition equalled at least the fair market value of the property disposed of, or (iii) the Institution submits to the Authority a written report of a nationally recognized firm of independent public accountants (A) showing that on a pro forma basis for its most recent fiscal year after giving effect to such disposition, and based upon the Institution's audited financial statements, the ratio of Net Revenues Available for Debt Service to the maximum Total Principal and Interest Requirements for Bonds, Alternative Indebtedness, and other long-term indebtedness for that or any subsequent fiscal year during which Bonds or Alternative Indebtedness will be Outstanding was at least 1.50 and that such transaction will not lower the ratio for the Institution by more than thirty percent (30%) from what it would have been without the transaction, or (B) that such pro forma ratio is greater than the ratio without the transaction, and (2) with respect to property not included in the Mortgaged Property, the Institution either complies with the provisions summarized in clause (iii) above, or obtains the consent of the Authority. The Institution may not dispose of cash and securities (other than in the ordinary course of operations and except as permitted by this paragraph or by the Agreement) in any one fiscal year in an amount exceeding five percent (5%) of the aggregate cash and securities of the Institution, valued at the lower of cost or market, as shown on its most recent audited financial statements, unless the Institution complies with clause (i) and either clause (ii) or clause (iii) of this paragraph.

The Institution may substitute for any accountants' report referred to above a written report by a Hospital Consultant showing that the estimated Net Revenues Available for Debt Service for the first full fiscal year after the transaction will meet the same tests. (M&TA Section 1008)

Borrowings. The Institution may not incur short-term indebtedness for borrowed money outstanding at any one time exceeding fifteen percent (15%) of net patient service revenues shown in its most recent audited financial statements and shall not have short-term indebtedness outstanding in excess of three percent (3%) of net patient service revenues shown on its most recent audited financial statements for a period of at least thirty (30) consecutive days in each of its fiscal years. This requirement may be waived by the Authority. (M&TA Section 1008)

Any indebtedness incurred by the Institution prior to the effective date of the amendments described in Appendix C-3 which is not additional Bonds or Alternative Indebtedness but which is Additional Indebtedness as defined in Appendix C-3 shall be subject to the tests specified therein for Additional Indebtedness. (SSA Section 708).

The Mortgaged Property

The Institution shall pay all costs of maintaining and operating the Mortgaged Property. It will maintain and repair the Mortgaged Property and repair, replace, restore or reconstruct it in the event of damage or destruction unless it provides for payment of the Bonds and Alternative Indebtedness in full or redeems the Bonds and Alternative Indebtedness pursuant to the special redemption provisions. (M&TA Sections 405, 407, FSA Sections 205 and 1001, SSA Sections 205 and 1001)

Casualty and Eminent Domain Proceeds

In the event of the damage to, destruction of all or any part of the Mortgaged Property, any applicable insurance or eminent domain proceeds shall be recovered and paid to the Trustee. From such proceeds the Trustee shall provide for payment or reimbursement of the reasonable expenses of obtaining the recovery and shall then give notice to the Institution of such expenses and the amount of the remaining proceeds (the "Net Proceeds").

The Trustee shall pay to the Institution so much of the Net Proceeds as may be needed for repair, replacement, restoration or reconstruction upon receipt of such evidence as it may require. Any Net Proceeds not required for repair, replacement, restoration or reconstruction shall be transferred to the Debt Service Reserve Fund to the extent necessary to make up any deficiency therein, and the remainder shall be deposited in the Redemption Fund, the Series E Redemption Fund or the Series F Redemption Fund pro rata in proportion to the outstanding principal amount of Bonds, the Series E Bonds and the Series F Bonds. However, if there shall be outstanding Alternative Indebtedness (in addition to the Series E Bonds and the Series F Bonds), any remaining Net Proceeds not required for repair, replacement, restoration or reconstruction shall be allocated between the Bonds, the Series E Bonds and the Series F Bonds and any other Alternative Indebtedness in accordance with the agreement between the Institution and the Alternative Lender, and the portion of remaining Net Proceeds allocable to Bonds, the Series E Bonds and the Series F Bonds shall be distributed as provided above.

In the event of a taking of any or all of the Mortgaged Property by eminent domain, the proceeds thereof shall be paid to the Trustee and dealt with as provided above with respect to proceeds of insurance. Unless the Institution elects to defease all of the Bonds, the Series E Bonds or the Series F Bonds or to redeem Bonds, the Series E Bonds and Series F Bonds with that portion of Net Proceeds allocable to the Bonds, the Series E Bonds and Series F Bonds as provided below, the Net Proceeds allocable to the Bonds shall be deposited promptly in the Debt Service Reserve Fund to the extent necessary to make up any deficiency therein, and the remainder shall be deposited in the Redemption Fund, the Series E Redemption Fund or the Series F Redemption Fund except that, in the case of a partial taking, the Institution may give notice of its election to restore the remaining property, in which case the provisions with respect to use of insurance proceeds for repair or replacement shall apply and the Institution shall be obligated to restore the operational utility lost by the taking.

The Institution may be relieved of its obligation to repair, replace, restore or reconstruct by taking all actions to discharge the lien of the Agreement, or with respect to any one casualty or series of related casualties (as determined by the Trustee), whenever the Net Proceeds of insurance or condemnation awards resulting from damage to or destruction or taking of all or a portion of the Mortgaged Property exceed twenty-five percent (25%) of the then full insurable value of the Mortgaged Property as determined by the Trustee, by electing to use such Net Proceeds (or a portion thereof exceeding twenty-five percent (25%) of such insurable value not used or to be used for partial repair, replacement, restoration or reconstruction) to redeem Bonds, the Series E Bonds and the Series F Bonds pursuant to the special redemption provisions of the Agreement and to repay outstanding Alternative Indebtedness (including the Series E Bonds and the Series F Bonds). In order to redeem Bonds, the Series E Bonds and the Series F Bonds, and to repay outstanding Alternative Indebtedness, the Institution shall direct the Trustee to transfer such Net Proceeds (or such portion thereof) in the manner provided in the Agreement and shall instruct the Trustee to redeem Bonds, the Series E Bonds and the Series F Bonds pursuant to the special redemption provisions of the Agreement from such proceeds allocable to Bonds, Series E and Series F Bonds deposited in the Redemption Fund, the Series E Redemption Fund and the Series F Redemption Fund; provided however, that no such Net Proceeds shall be used to redeem Series F Bonds unless either (1) the Authority and the Bond Issuer consent to such redemption or (2) the Institution meets the requirements for issuing one dollar of Additional Indebtedness described in Appendix C-3 under "Limitations on Incurrence of Additional Indebtedness" with revenues and expenses from the damaged, destroyed or taken mortgaged property subtracted from all test periods.. (M&TA Sections 405, 407, FSA Section 702, SSA Section 702)

Allocation of Net Proceeds

Any Net Proceeds or Gross Receipts derived from the exercise of the rights and remedies of the Authority and the Trustee under the Agreement as to the Bonds, under the First Supplemental Agreement as to the Series E Bonds, and under the Second Supplemental Agreement as to the Series F Bonds shall be applied to payment of outstanding principal, interest and premium, if any, on the Bonds, the Series E Bonds and the Series F Bonds, respectively, pro rata in proportion to the principal amount thereof Outstanding on the date of payment. (FSA Section 705, SSA Section 705)

Substitution and Release of Mortgaged Property

The Institution may remove and sell or otherwise use or dispose of Mortgaged Personalty and fixtures included in the Mortgaged Property when, in the reasonable determination of the Institution, the same have become obsolete, worn out or unnecessary for the operations of the Institution at the premises, provided that the Institution repairs any damage caused by the removal and that the removal does not decrease the operating utility of the Mortgaged Property. Property so removed shall cease to be subject to the lien of the Agreement. (M & TA Section 402)

The Authority may make partial releases of the Mortgaged Property from the lien of the Agreement. In addition the Authority may release easements in or over the Mortgaged Property, shall subordinate the lien of the Agreement on vacant land to facilitate financing of construction thereon, and may make other releases, substitutions and subordinations which it deems not materially adverse to the Bondowners; provided, however, that no such action shall be taken without the written consent of the Trustee, if an Event of Default known to the Authority then exists. The Institution may erect additional buildings on the Mortgaged Property and may alter, remodel or improve the Mortgaged Property, provided that such alteration or remodeling shall not damage the basic structure thereof or materially decrease its value. In addition, with the written consent of the Authority, the Institution may demolish buildings and structures if such demolition will not materially impair the operations of the Institution in order to clear land for new buildings and structures. Such new buildings, improvements, alterations, or remodeling shall be deemed a part of the Mortgaged Property and shall be subject to the lien thereof, but shall be at the cost of the Institution and subject to the lien of the Agreement, and no action may be taken which would cause the Mortgaged Property to violate zoning or other land use regulations. (M&TA Sections 204, 406)

Amendments

The Second Supplemental Agreement may be amended by the parties without Bondowner consent to correct the description of the Mortgaged Property or to subject any additional property to the lien of the Agreement, to add to the covenants and agreements of the Institution or surrender or limit any right or power of the Institution, to amend the Second Supplemental Agreement with respect to the Rebate Fund or unclaimed moneys, or to cure any ambiguity or defect, or to add provisions not inconsistent with the Second Supplemental Agreement and which do not impair the security for the Series F Bonds.

In other cases and except as provided below, amendments require the written consent of the owners of at least two-thirds (2/3) in principal amount of the Series F Bonds Outstanding (which may mean the Bond Insurer as provided under "The Bond Insurer"). Unanimous consent of the affected Bondowners is required to (1) extend the maturity of any Series F Bond; (2) reduce the principal amount or interest rate of any Series F Bond; (3) make any Series F Bond redeemable other than in accordance with its terms; (4) create a preference or priority of any Series F Bond or over any other Series F Bond; or (5) reduce the consent requirements for any amendment, without the unanimous written consent of the affected Series F Bondowners. When the requisite number of consents have been obtained for an amendment which requires Bondowner consent, the Trustee shall, within ninety (90) days, mail or cause to be mailed notice of such event to the Bondowners.

Any amendment of the Second Supplemental Agreement must be accompanied by an Opinion of Bond Counsel selected by the Authority to the effect that the Second Supplemental Agreement permits the amendment. (SSA Section 1101)

For amendments to the Agreement, consented to by the Series F Bondowners upon purchase of the Series F Bonds, see Appendix C-3 -- "Summary of Future Amendments to the Agreement."

Defeasance

When there are in the Series F Debt Service Fund and the Series F Redemption Fund in the aggregate sufficient funds, or Government or Equivalent Obligations in such principal amounts, bearing interest at such rates and with such maturities as will provide sufficient funds to pay or redeem the Series F Bonds in full (as verified by a report of an independent nationally-recognized certified public accountant), and when all the rights under the Second Supplemental Agreement of the Authority and Trustee have been provided for, upon written notice from the Institution to the Authority and Trustee, the Series F Bondowners shall cease to be entitled to any benefit or security under the Second Supplemental Agreement except the right to receive payment of the funds deposited and held for payment and other rights which by their nature cannot be satisfied prior to or simultaneously with termination of the lien of the Second Supplemental Agreement, the security interests created by the Second Supplemental Agreement (except in such funds and investments) shall terminate and title to the Mortgaged Property shall revert to the Institution to the extent such title is encumbered by the Agreement, and the Authority and the Trustee shall execute and deliver such instruments as may be necessary to discharge the lien and security interests created under the Second Supplemental Agreement; provided, however, that if any such Series F Bonds are to be redeemed prior to the maturity thereof, the Authority shall have taken all action necessary to redeem such Series F Bonds and notice of such redemption shall have been duly mailed in accordance with the Second Supplemental Agreement or irrevocable instructions so to mail shall have been given to the Trustee. Upon defeasance, the funds and investments required to pay or redeem the Series F Bonds in full shall be irrevocably set aside for that purpose and moneys held for defeasance shall be invested only as provided above in this paragraph. Any funds or property held by the Trustee and not required for payment or redemption of the Series F Bonds in full shall, after satisfaction of all the rights of the Authority and the Trustee and after allowance for payment into the Rebate Fund with respect to the Series F Bonds, if any, be distributed to the Institution upon such indemnification, if any, as the Authority or the Trustee may reasonably require. (SSA Section 210)

Election of Additional Bonds

The Institution, with the consent of the Authority, may elect at any time after the issuance of the Series F Bonds as Alternative Indebtedness under the Agreement, to have the Series F Bonds be considered as Additional Bonds under the Agreement, and to have the owners of the Series F Bonds be considered Bondowners under the Agreement. (SSA Section 1102)

SUMMARY OF FUTURE AMENDMENTS TO THE AGREEMENT

The following is a summary of certain provisions of the Second Supplemental Agreement which allows certain modifications to the Agreement, including releasing certain security for the Bonds and Alternative Indebtedness, and modifying certain of the Institution's covenants and agreements. The Series F Bondowners are deemed to have consented to these amendments through their purchase of the Series F Bonds. These amendments shall take effect upon obtaining the necessary consents under the Agreement, or upon the retirement or defeasance of the Series D Bonds, Series E Bonds and Pool Loan.

Definitions

In addition to the terms defined elsewhere on this Official Statement, the following terms have the following meanings in this Appendix C-3 and supersede any similar definition contained elsewhere in this Official Statement:

"Balloon Indebtedness" shall mean (i) Long-Term Indebtedness which is part of an issue of Indebtedness 25% or more of the original principal amount of which has its Date of Maturity in the same 12 month period or (ii) any portion of an issue of Long-Term Indebtedness which is so designated by the Institution pursuant to a certificate of an Authorized Officer stating that such portion shall be deemed to constitute a separate issue of Balloon Indebtedness.

"Book Value," when used in connection with Property shall mean the cost of such Property, net of accumulated depreciation, calculated in conformity with generally accepted accounting principles.

"Capitalization" shall mean the sum of (i) the aggregate principal amount of all Outstanding Long-Term Indebtedness plus (ii) the Institution's unrestricted fund balances as shown on its most recent audited financial statements.

"Indebtedness" shall mean all obligations of the Institution for borrowed money, or installment sale and capitalized lease obligations, incurred or assumed, including guaranties with respect to money borrowed, Long-Term Indebtedness, Short-Term Indebtedness, subordinated Indebtedness or any other obligation of the Institution for payments of principal and interest with respect to borrowed money but excluding any Hedging Contract.

"Irrevocable Deposit" shall mean the irrevocable deposit in trust of cash in an amount (or Government or Equivalent Obligations the principal of and interest on which will be in an amount) and under terms sufficient to pay all or a portion of the principal of, premium, if any, and interest on, as the same shall become due, any Indebtedness which immediately prior to the time of such deposit is outstanding. The trustee of such deposit may be the Trustee or any other trustee authorized to act in such capacity.

"Lien" shall mean any mortgage or pledge of, security interest in or lien or encumbrance on any Property which secures any Indebtedness or any other obligation of the Institution, or which secures any obligation of any person, excluding liens applicable to Property in which the Institution has only a leasehold interest.

"Long-Term Indebtedness" shall mean any Indebtedness which is not Short-Term Indebtedness.

"Net Revenues Available for Debt Service" means the excess of revenues over expenses (excluding from revenues and expenses extraordinary items and income from Irrevocable Deposits and excluding from expenses depreciation, interest on Long-Term Indebtedness and amortization), as determined in accordance with generally accepted accounting principles.

"Property" shall mean any and all of the Institution's rights, titles and interests in and to any and all property, whether real or personal, tangible or intangible and wherever situated including, without limitation, accounts, accounts receivable, contract rights and general intangibles, and all proceeds of all of the foregoing, whether cash or non-cash.

"Short-Term Indebtedness" shall mean any issue of Indebtedness no portion of which has a Date of Maturity more than one year from the date of original issuance thereof.

"Total Principal and Interest Requirements" means amounts required during a year to amortize principal of and to pay interest (other than capitalized interest or interest or principal paid from the proceeds of or investment earnings on funds escrowed wholly or in part therefor or income from or principal of Irrevocable Deposits) on Long-Term Indebtedness taking into account in determining the Total Principal and Interest Requirements for any future period that (i) at the election of the Institution, Indebtedness shall be deemed payable on the dates and in the amounts provided under "Limitations on Incurrence of Additional Indebtedness" below; (ii) principal on all Indebtedness (including the Bonds) shall be deemed to be payable on the Date of Maturity thereof; and (iii) with respect to Indebtedness refunded or refinanced during such period, the amounts of principal and interest taken into account during such period shall exclude amounts payable from proceeds of the refunding Indebtedness. Computations of debt service on Long-Term Indebtedness shall include debt service on obligations of others for borrowed money guaranteed by the Institution as provided under "Limitations on Incurrence of Additional Indebtedness" below. If any issue of Indebtedness bears other than a fixed rate of interest or contains one or more substantially disproportionate maturities (after treating sinking fund installments as if they were maturities), which maturities do not constitute Balloon Indebtedness, it shall be included as provided under "Limitations on Incurrence of Additional Indebtedness" below. Notwithstanding the preceding sentence, so long as the Series F Bonds are Outstanding, variable rate indebtedness shall be assumed to bear interest, for future periods and for all purposes of clause (c)(ii)(B) under "Limitations on Incurrence of Additional Indebtedness," at a rate equal to the greatest of (i) the actual rate borne on the date of calculation by such variable rate indebtedness, or the projected initial rate if such variable rate indebtedness is not outstanding, (ii) the average rate borne during the twelve months preceding the date of calculation by such variable rate indebtedness, or, if such variable rate indebtedness has not been outstanding for twelve months and is computed by reference to an index, by outstanding variable rate debt for which the interest rate is determined by reference to the same or a comparable index, and (iii) 110% of the average Bond Buyer 25 Bond Revenue Index over the twelve months preceding the date of calculation. (SSA Section 1202)

Release of Liens on Mortgaged Property and Gross Receipts

Notwithstanding any provision of the Mortgage and Trust Agreement, the First Supplemental Agreement or the Second Supplemental Agreement to the contrary, the Authority consents to the discharge of the lien on the Mortgaged Property granted pursuant to the Mortgage and Trust Agreement, the First Supplemental Agreement and the Second Supplemental Agreement, and to the release of the lien upon the Gross Receipts of the Institution, created pursuant to the Mortgage and Trust Agreement, the First Supplemental Agreement, and the Second Supplemental Agreement. (SSA Section 1203)

Insurance

Section 404 of the Mortgage and Trust Agreement relating to insurance requirements, summarized in Appendix C-2 under the heading "Insurance," is amended by replacing it with the following:

(a) The Institution shall (i) keep its plant, equipment and furnishings included in its Property insured against fire, lightning and extended coverage perils and against such other risks as are customarily insured against by similar institutions in the area; (ii) to the extent required by law, carry worker's compensation insurance (which may be through the so-called Massachusetts Self-Insurance Group), disability insurance and other insurance covering injury, sickness, disability or death of employees; (iii) maintain insurance against liability of the Institution imposed by law or assumed by contract for injuries to persons (excluding liability covered by clauses (iv) and (v)), and for death of persons from such injuries and for damage to property; (iv) maintain motor vehicle liability insurance covering owned, unowned and hired motor vehicles, protecting the Institution against liability for property damage; and (v) if it provides health care services, maintain insurance against liability of the Institution for professional malpractice.

(b) In lieu of obtaining third-party coverage for the risks described in paragraph (a), the Institution may self-insure any of the required coverages or a portion thereof (or may participate in captive insurance programs sponsored by the Institution or any association or organization exposed to comparable risks, including New England Medical Insurance Company); provided that with respect to any future self-insurance programs the Institution delivers to the Authority and the Trustee a report of an insurance consultant acceptable to the Authority stating that the self-insurance of such risks (or such participation) is consistent with reasonable management and insurance practices. Any self insurance programs shall be required to be reviewed annually by a nationally recognized actuary which actuary shall prepare a report to be distributed to the Authority, the Trustee and the Bond Insurer, indicating whether adequate reserves for such programs are deposited and maintained with an independent corporate trustee and making recommendations with respect to the programs. The Institution shall comply with all such recommendations with respect to a self-insurance program or shall, within one year of such recommendations, discontinue the program. (SSA Section 1204)

Limitations on Creation of Liens

Section 1008 of the Mortgage and Trust Agreement regarding encumbrances on the Institution's property, summarized in Appendix C-2 under the heading "Encumbrance, Sale and Lease of Property; Borrowings," is amended by replacing it with the following:

(a) The Institution agrees that it will not create or suffer to be created or exist any Lien upon any Property now owned or hereafter acquired by it other than Permitted Liens.

(b) Permitted Liens shall consist of Liens which are described in any one or more of the following clauses:

(i) Any judgment lien or notice of pending action against the Institution as to which the Institution is uninsured so long as such judgment or pending action is being contested and execution thereon is stayed;

(ii) (A) Rights reserved to or vested in any municipality or public authority by the terms of any right, power, franchise, grant, license, permit or provision of law, affecting any Property, to (1) terminate such right, power, franchise, grant, license or permit, provided that the exercise of such right would not materially impair the use of the Property or materially and adversely affect the value thereof, or (2) purchase, condemn, appropriate or recapture, or designate a purchaser of, such Property; (B) any Liens on any Property for taxes, assessments, levies, fees, water and sewer rents, and other governmental and similar charges and any Liens of mechanics, materialmen, laborers, suppliers or vendors for work or services performed or materials furnished in connection with such Property, which are not due and payable or which are not delinquent or which, or the amount or validity of which, are being contested and execution thereon is stayed or, with respect to Liens of mechanics, materialmen, and laborers, have been due for less than 60 days; and (C) easements, rights-of-way, servitudes, restrictions and other minor defects, encumbrances, and irregularities in the title to any Property which do not materially impair the use of such Property or materially and adversely affect the value thereof;

(iii) Any Lien existing on the date of the Second Supplemental Agreement provided that no such Lien (or the amount of Indebtedness secured thereby) may be increased, extended, renewed or modified to apply to any Property or Gross Receipts of the Institution not subject to such Lien on such date, unless such Lien as so increased, extended, renewed or modified otherwise qualifies as a Permitted Lien under the Agreement;

(iv) Purchase money security interests and security interests existing on any Property prior to the time of its acquisition through purchase, merger, consolidation or otherwise, or placed upon Property to secure a portion of the purchase price thereof, or lessor's interests in leases required to be capitalized in accordance with generally accepted accounting principles; provided that the aggregate principal amounts secured by any such interests shall not exceed at the time of incurrence or assumption the fair market value of such Property;

(v) Liens arising by reason of good faith deposits in connection with leases of real estate, bids or contracts (other than contracts for the payment of money), deposits to secure public or statutory obligations, or to secure, or in lieu of, surety, stay or appeal bonds, and deposits as security for the payment of taxes or assessments or other similar charges;

(vi) Any Lien arising by reason of deposits with, or the giving of any form of security to, any governmental agency or any body created or approved by law or governmental regulation for any purpose at any time as required by law or governmental regulation as a condition to the transaction of any business or the exercise of any privilege or license, or to enable the Institution to maintain self-insurance or to participate in any funds established to cover any insurance risks or in connection with workers' compensation, unemployment insurance, pension or profit-sharing plans or other similar arrangements, or to share in the privileges or benefits required for companies participating in such arrangements;

(vii) Any Lien arising by reason of an Irrevocable Deposit;

(viii) Any Lien in favor of a trustee on the proceeds of Indebtedness prior to the application of such proceeds or on moneys to repay Indebtedness while held in a debt service reserve fund or on any moneys to secure payment of the trustee's fees;

(ix) Liens on moneys deposited by patients or others with the Institution as security for or as prepayment for the cost of patient care;

(x) Liens on Property received by the Institution through gifts, grants or bequests, such Liens being due to restrictions on such gifts, grants or bequests of Property or the income thereon, up to the fair market value of such Property;

(xi) Statutory rights of the United States of America by reason of federal funds made available under 42 U.S.C. §291 et seq. and similar rights under other federal and state statutes relating to the Hill-Burton program;

(xii) Liens for taxes or special assessments not then delinquent or which are being contested in good faith;

(xiii) Liens on Property due to rights of third-party payors for recoupment of amounts paid to the Institution;

(xiv) Liens on property, plant and equipment of the Institution securing Long-Term Indebtedness incurred after the effective date of the amendments, provided that the value of the properties subject to such lien shall not at any time exceed 15% of the Book Value (as shown in the Institution's most recent audited financial statements) or current value established by an appraisal acceptable to the Authority, whichever is greater, of the Institution's property, plant and equipment;

(xv) After the taking effect of the amendments summarized in this Appendix C-3, any Lien created or permitted by the Agreement;

(xvi) Liens on accounts receivable in an aggregate amount not in excess of 25% of accounts receivable, net of contractual allowances, free care and bad debts, as shown on the Institution's most recent audited financial statements, securing Short-Term Indebtedness incurred in accordance with the Agreement;

(xvii) Any Lien arising solely by reason of a lease of Property to others which lease would not have any material adverse effect upon (A) the security for the Bonds, (B) the operations of the Property, or (C) the amount of Net Revenues Available for Debt Service;

(xviii) Any Lien upon Property the loss of which Property would not (A) have any material adverse effect upon the security for the Series F Bonds or the operations of the Property or (B) result in a decrease in Net Revenues Available for Debt Service at any time during which the Series F Bonds will be outstanding;

(xix) Any Lien on Property securing Indebtedness which is secured solely by such Property and the revenues with respect thereto provided that such Property was not financed under the Agreement and that revenues, expenses and the debt service requirement with respect thereto shall be disregarded for purposes of historical and projected debt service coverage ratios calculated under the Agreement provided, however, that real property owned by the Institution as of the date of the Second Supplemental Agreement shall not be subdivided for purposes of compliance with this paragraph; and

(xx) Any Lien on Property securing Indebtedness provided a parity Lien on such Property is granted in favor of the Authority securing the Bonds, the Series E Bonds and the Series F Bonds equally and ratably. (SSA Section 1205)

Limitations on Incurrence of Additional Indebtedness

Article V of the Mortgage and Trust Agreement regarding the incurrence of additional indebtedness, summarized in Appendix C-2 under the headings "Additional Bonds" and "Alternative Indebtedness," is amended by replacing it with the following:

(a) The Authority may issue additional Bonds to complete the Project or to refund Bonds previously issued hereunder, and upon fulfillment of the following conditions, the Authority may issue additional Bonds to finance or refinance any other project permitted under the Act but in each case only with the written consent of the Authority, which consent shall not be unreasonably withheld after considering the interests of the Bondowners, and the Institution may incur additional Indebtedness for any purpose or guarantee the indebtedness of others (provided that the indebtedness guaranteed, if issued directly by the Institution, could be issued as additional Indebtedness under this section). All indebtedness incurred in connection with this section shall be deemed "Additional Indebtedness."

If the Additional Indebtedness is issued by the Authority, prior to the delivery of the Additional Indebtedness, the Institution, the Authority and the Trustee shall enter into a supplemental agreement providing for the details of the Additional Indebtedness, including the application of the proceeds thereof substantially in accordance with the provisions hereof relating to the Outstanding Bonds. The supplemental agreement shall require payments by the Institution at such times and in such manner as shall be necessary to provide for full payment of the debt service on the Additional Indebtedness as it becomes due. The supplemental agreement may also amend any other provision of the Agreement, provided that it will not have a material adverse effect upon the security for the Bonds other than that implicit in the authorization of parity indebtedness.

The interest on Additional Indebtedness which is additional Bonds shall be payable semi-annually on January 1 and July 1 of each year. The principal payments or sinking fund installments shall be payable on July 1 of each year.

(b) If the Additional Indebtedness is issued by a lender other than the Authority (an "Alternative Lender"), the Institution shall deliver to the Authority and the Trustee an executed counterpart of any agreement between the Institution and the Alternative Lender. In addition, there shall have been filed with the Authority and the Trustee an opinion of nationally recognized bond counsel satisfactory to the Authority that the agreement between the Institution and the Alternative Lender and any supplement to the Agreement in connection therewith are permitted by this Agreement and that the creation of any security interests in that separate agreement for the benefit of the holders of Additional Indebtedness is permitted by law and will not materially adversely affect (other than as implicit in the authorization of parity debt) the rights of the Bondowners to realize upon their share of the security interests, if any, granted herein.

Unless waived in writing by the Authority, the agreement between the Institution and the Alternative Lender shall contain the following provisions:

(i) Any Lien on any Property of the Institution granted to secure Additional Indebtedness, except for Permitted Liens described in clauses (i) through (xix), inclusive, under the heading "Limitations on Creation of Liens" in this Appendix C-3, shall be extended also to secure the obligations of the Institution under this Agreement equally and ratably with such Additional Indebtedness; and

(ii) The Alternative Lender and the trustee, if any, appointed to administer the Additional Indebtedness (the "Additional Indebtedness Trustee") shall notify the Authority, the Trustee and the Institution of any default in a payment by the Institution with respect to debt service on the Additional Indebtedness immediately upon becoming aware of such default.

The agreement between the Institution and the Alternative Lender shall also set forth the specific terms of allocation between the Bonds and Additional Indebtedness (other than additional Bonds) (based on the levels of outstanding amounts of Bonds and such Additional Indebtedness from time to time, which may include interest to the extent permitted by such agreement) of any net proceeds derived from the exercise of the rights and remedies of the Authority and the Trustee under this Agreement and/or of any net proceeds derived from the exercise of the rights and remedies of the Alternative Lender and the Alternative Indebtedness Trustee, if any, under the agreement between the Institution and the Alternative Lender.

(c) No Additional Indebtedness shall be incurred by the Institution (except to complete the Project or to refund Bonds) unless no Event of Default under the Agreement shall exist and there shall have been filed with the Authority and the Trustee:

(i) In the case of Additional Indebtedness involving a construction project other than refunding Bonds, a certificate of an architect acceptable to the Authority setting forth (A) the estimated cost of the project being financed or refinanced with the proceeds of the Additional Indebtedness, (B) the estimated amounts which will be required from month to month for paying such cost, and (C) the estimated date of completion of such project;

(ii) Subject to the provisions of paragraph (d) below, (A) a written report by the Institution which shall show that Net Revenues Available for Debt Service for the two prior fiscal years of the Institution were at least 1.25 times the maximum Total Principal and Interest Requirements for Indebtedness (including the proposed Additional Indebtedness) for each such year and will be 1.25 for each subsequent year during which Additional Indebtedness will be Outstanding; or

(B) (x) a report of a nationally recognized firm of independent public accountants acceptable to the Authority setting forth the Net Revenues Available for Debt Service for the most recent fiscal year of the Institution for which audited financial statements are available which shall show that Net Revenues Available for Debt Service for such period equal at least 1.10 times the Total Principal and Interest Requirements for the same period; and (y) a written report by a Hospital Consultant stating that the estimated Net Revenues Available for Debt Service during the first full fiscal year of operation of the facilities to be financed by the Additional Indebtedness or the first full fiscal year after a refinancing, if the facilities being refinanced are already in use and operation, are not expected to be less than 1.10 times the maximum Total Principal and Interest Requirements for Indebtedness (including the Additional Indebtedness) for that or any subsequent fiscal year during which Additional Indebtedness will be Outstanding. The written report by a Hospital Consultant shall not be required, however, if the Institution receives the consent of the Bond Insurer and files a certificate of the chief financial officer of the Institution stating that (1) the estimated Net Revenues Available for Debt Service during the first full fiscal year of operation of the facilities to be financed by the Additional Indebtedness or the first full fiscal year after a refinancing, if the facilities being refinanced are already in use and operation, are not expected to be less than 1.30 times the maximum Total Principal and Interest Requirements for Indebtedness (including the Additional Indebtedness) for such fiscal year or any subsequent fiscal year during which Additional Indebtedness will be outstanding; or (2) the principal amount of the Additional Indebtedness and all other Additional Indebtedness incurred under this clause (y)(2) does not exceed 10% of the Institution's Capitalization as shown on its most recent audited financial statements.

(d) If the Institution is unable to satisfy the requirements of paragraph (c) above, such otherwise unmet requirements shall be deemed satisfied if there shall be filed with the Authority and the Trustee a report by a Hospital Consultant containing the following conclusions or findings:

(i) That applicable laws and regulations have prevented or will prevent generation of the required level of Net Revenues Available for Debt Service, and, if requested by the Authority, an accompanying opinion of counsel acceptable to the Authority setting forth any conclusions of law relevant to such opinion;

(ii) That, with regard to a failure to satisfy the requirements of clause (x) of paragraph (c)(ii)(B) above, the Institution has generated the maximum amount of Net Revenues Available for Debt Service which could reasonably be generated given such governing laws and regulations during the applicable period and that the Net Revenues Available for Debt Service for the period equal at least 1.00 times the Total Principal and Interest Requirements for the period; and

(iii) That, with regard to a failure to satisfy the requirements of clause (y) of paragraph (c)(ii)(B) above, based upon forecasts and estimates contained in the report, the Institution will generate the maximum amount of Net Revenues Available for Debt Service which can reasonably be generated given such governing laws and regulations during the applicable period and that the estimated Net Revenues Available for Debt Service for the applicable period are not expected to be less than 1.00 times the maximum Total Principal and Interest Requirements for Indebtedness (including the Additional Indebtedness) for that or any subsequent fiscal year during which Additional Indebtedness will be Outstanding.

(e) The Institution may incur Short-Term Indebtedness if: (i) immediately after the incurrence of such Short-Term Indebtedness, the principal amount of all outstanding Short-Term Indebtedness does not exceed the greater of (A) 15% of the Institution's total operating revenues or (B) 75% of the Institution's aggregate accounts receivable (net of provision for uncollectible accounts and contractual adjustments), both as shown on the Institution's most recent audited financial statements, and (ii) during the 12 months immediately preceding the incurrence of such Short-Term Indebtedness there shall have been a period of at least 30 consecutive days in which the Institution had outstanding Short-Term Indebtedness of no more than five percent (5%) of total operating revenues as shown in the Institution's most recent audited financial statements, provided that the requirement of this clause (ii) shall be waived if (1) there is delivered to the Authority and the Trustee a Hospital Consultant's report confirming that there is a temporary interruption in the flow of reimbursement revenues from third parties, or (2) if and to the extent that such Short-Term Indebtedness could be incurred under the Agreement as if it were Long-Term Indebtedness. Failure to comply with the provisions of this paragraph shall not be a default under the Agreement, but until the provisions of clause (ii) shall be satisfied, all amounts of Short-Term Indebtedness in excess of the five percent (5%) permitted hereunder shall be deemed to be Long-Term Indebtedness for the purposes of calculating Total Principal and Interest Requirements.

(f) The Institution may not guarantee the obligations of others for borrowed money except as provided above and in an additional amount not exceeding in the aggregate at the time of any particular guarantee one percent (1.00%) of the Institution's operating revenues shown on the Institution's most recent audited financial statements.

(g) In determining Total Principal and Interest Requirements of the Institution and debt service coverage ratios, whether historical or projected, computations of debt service on Long-Term Indebtedness shall include an amount equal to twenty percent (20%) of the debt service on obligations of others for borrowed money guaranteed by the Institution (other than guaranties qualifying as Long-Term Indebtedness incurred pursuant to the Agreement) for the period during which such Total Principal and Interest Requirement is computed; provided, however, that debt service on such guaranteed obligations with respect to which a payment has been made by the Institution during the preceding twelve (12) months or with respect to which the primary obligor is in default by reason of bankruptcy or insolvency shall be included at one hundred percent (100%) of such debt service.

(h) At the election of the Institution, for the purpose of computations of Total Principal and Interest Requirements and debt service coverage ratios, whether historical or projected, the principal and interest deemed to be payable on Balloon Indebtedness for the period for which such calculation is being made shall be as set forth below:

(i) If the Institution has obtained a binding commitment of a financial institution to refinance such Balloon Indebtedness (or a portion thereof), including without limitation, a letter of credit or a line of credit, which commitment is subject only to usual conditions applicable to loans to entities similar to the Institution, the Balloon Indebtedness (or portion thereof) may be deemed to be payable in accordance with the terms of the refinancing arrangement; or

(ii) If (A) the Date of Maturity of any portion of such Balloon Indebtedness is more than 18 months after the date of any transaction for which a determination of Total Principal and Interest Requirements projection is made or (B) the condition of paragraph (i) above is satisfied with respect to such portion by a refinancing arrangement having a term not less than 18 months, such portion of such Balloon Indebtedness may be deemed to be Indebtedness payable over a 25 year term, at the interest rate certified below or with respect to Indebtedness which bears interest at other than a fixed rate, as provided in the Agreement, in equal annual installments of principal and interest, provided that the Institution has delivered to the Authority and the Trustee a certificate of an investment banker satisfactory to the Authority stating that it is reasonable to assume that such Indebtedness could be sold and stating the interest rate then applicable to 25 year obligations of comparable quality and type; provided, however, that the aggregate principal amount of Balloon Indebtedness deemed payable over 25 years under this clause (ii) shall be limited to an amount equal to 20% of the Institution's total revenues as shown on its most recent audited financial statements.

(i) In determining Total Principal and Interest Requirements and debt service coverage ratios, whether historical or projected, the interest deemed to be payable on Indebtedness which bears interest at other than a fixed rate shall be calculated, at the option of the Institution, either at the average interest rate payable on such Indebtedness for the preceding twelve months, or, if such Indebtedness was outstanding for less than twelve months, the highest rate payable while it was outstanding, or the interest rate on comparable obligations with a maturity of twenty-five years as set forth in a certificate of an investment banking firm acceptable to the Authority; provided, however, that the Institution may make other assumptions with respect to such Indebtedness as it deems reasonable and as are reasonably acceptable to the Authority. (SSA Section 1206)

Maintenance of Corporate Existence;Transfers of Assets

Section 1006 of the Mortgage and Trust Agreement regarding mergers and transfers, summarized in Appendix C-2 under the heading "Maintenance of Corporate Existence," is amended by deleting it and replacing it with the following:

The Institution shall maintain its existence as a nonprofit corporation qualified to do business in Massachusetts and shall not dissolve or dispose of all or substantially all of its assets, or consolidate with or merge into another entity or entities, or permit one or more other entities to consolidate with or merge into it, except that it may consolidate with or merge into one or more other entities or permit one or more other entities to consolidate with or merge into it, or transfer all or substantially all of its assets to one or more other entities (and thereafter dissolve or not dissolve as it may elect) if (a) each of the surviving or resulting entity or entities meets certain requirements set forth in the Agreement as to its nonprofit, tax-exempt status, (b) the transaction does not result in a conflict, breach or default as referred to in the Agreement, (c) the surviving, resulting or transferee entity or entities each assumes by written notice to the Authority and the Trustee all the obligations of the Institution under the Agreement and has a Cushion Ratio of at least 1.75 based on its most recent audited financial statements, and (d) the Institution or transferee or surviving or resulting entity or entities either (x) shall obtain the consent of the Authority or and the Bond Insurer or (y) could incur at least one dollar of Additional Indebtedness under paragraph (c)(ii) (other than under clause (c)(ii)(B)(y)(2)) under the heading "Limitations on Incurrence of Additional Indebtedness," herein (assuming, as to such transferee, surviving or resulting entity, that those subsections referred to them instead of the Institution and provided that the first full fiscal year referred to in paragraph (c)(ii)(B) under such heading shall be the one after the transfer of Property, consolidation or merger), provided, however, that this clause (d) shall not be applicable if the Property acquired, transferred or disposed of as a result of all such mergers, consolidations or transfers in any fiscal year of the Institution are less than five percent (5%) of total assets as shown in its most recent audited financial statements.

Section 1008 of the Mortgage and Trust Agreement, summarized in Appendix C-2 under the heading "Encumbrance, Sale and Lease of Property; Borrowings" is amended by deleting it and replacing it with the provisions summarized above under the headings "Limitations on Creation of Liens" and "Limitations on Incurrence of Additional Indebtedness" and with the following:

The Institution shall not sell or dispose of or spin off any Property, other than property which is obsolete, no longer useful in the operations of the Institution or sold, transferred or disposed of for its then fair market value in the ordinary course of business except that it may transfer or spin off any of its assets in any one fiscal year if the Institution would have a Cushion Ratio of at least 1.75 after such transfer based on its most recent audited financial statements and assuming the transfer occurred during the year covered by such statements and the Institution (a) shall obtain the consent of the Authority and the Bond Insurer or (b) could incur at least one dollar of Additional Indebtedness under clause (c)(ii)(B)(y)(2) under the heading "Limitations on Incurrence of Additional Indebtedness" after giving effect to the disposition and provided that the first full fiscal year referred to shall be the first full fiscal year after the disposition, provided, however, that this paragraph shall not be applicable if the Property disposed of as a result of all dispositions in any fiscal year of the Institution is less than five percent (5%) of its total assets as shown on its most recent audited financial statements. The Institution shall not make transfers of cash or securities in the aggregate in any one fiscal year which cause its unrestricted fund balance to be reduced by more than ten percent (10%). (SSA Section 1207)

Casualty and Eminent Domain Proceeds

Sections 405 and 407 of the Mortgage and Trust Agreement, regarding casualty and eminent domain proceeds, summarized in Appendix C-2 under the heading "Casualty and Eminent Domain Proceeds" shall be amended to provide as follows:

If there is delivered to the Trustee a certificate of the chief financial officer of the Institution, or if requested by the Authority, a Hospital Consultant's report, to the effect that the Net Revenues Available for Debt Service for the next two fiscal years immediately following such loss or condemnation will be at least 1.10 times Total Principal and Interest Requirements, then the Institution may retain the amounts for its own use. (SSA Section 1209)

Default Provisions

The provisions summarized under "Default (g) Breach of Other Agreements" in the Summary of the Agreement are amended by deleting the words "or is empowered to accelerate."

Rate Covenant

The provisions summarized under "Rate Covenant" in the summary of the Agreement are amended by changing "1.20" to "1.10" in the fourth and seventh sentences in the paragraph.

PALMER & DODGE

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(Closing Date)

Massachusetts Health and Educational
Facilities Authority
99 Summer Street, Suite 1000
Boston, Massachusetts 02110

We have acted as bond counsel to the Massachusetts Health and Educational Facilities Authority (the "Authority") in connection with the issuance by the Authority of the following bonds (the "Series F Bonds"):

$113,745,000
Revenue Bonds, New England Medical Center Hospitals Issue,
Series F, dated February 1, 1992
(the "Bonds")

We have examined the law and such certified proceedings and other papers as deemed necessary to render this opinion, including the Mortgage and Trust Agreement (the "Mortgage and Trust Agreement") dated as of September 2, 1986, among the Authority, New England Medical Center Hospitals, Inc. (the "Institution"), and The First National Bank of Boston, as Trustee, providing for the issuance of the Authority's Revenue Bonds, New England Medical Center Hospitals Issue, Series D (the "Series D Bonds"), as amended and supplemented by a First Supplemental Agreement, dated as of August 2, 1988, by and among the Authority, the Institution and BayBank Middlesex, as Trustee (the "First Supplemental Agreement") providing for the issue of the Authority's Revenue Bonds, New England Medical Center Hospitals Issue, Series E (the "Series E Bonds") on a parity with the Series D Bonds, and the Second Supplemental Agreement (the "Second Supplemental Agreement") dated as of January 7, 1992, among the Authority, the Institution, and BayBank, as Trustee (the "Trustee").

As to questions of fact material to our opinion we have relied upon representations and covenants of the Authority and the Institution contained in the Mortgage and Trust Agreement, the First Supplemental Agreement and the Second Supplemental Agreement, the certified proceedings and other certifications of public officials furnished to us, and certifications by officials of the Institution and others, without undertaking to verify the same by independent investigation.

The Bonds are issued pursuant to the Mortgage and Trust Agreement, as amended and supplemented by the First Supplemental Agreement and the Second Supplemental Agreement. The Mortgage and Trust Agreement, as so amended and supplemented, is hereinafter referred to as the "Agreement". Under the Second Supplemental Agreement the Institution has agreed to make payments sufficient to pay when due the principal (including sinking fund installments) of, and premium (if any) and interest on the Bonds. Such payments and other moneys payable to the Authority or the Trustee under the Agreement, including proceeds derived from any security provided thereunder (collectively the "Revenues"), and the rights of the Authority under the Agreement to receive the same (excluding, however, certain administrative fees, indemnification, and reimbursements), are pledged and assigned by the Authority to the Trustee as security for the Bonds. The Bonds are payable solely from the Revenues.

Reference is made to an opinion of even date of Ropes & Gray, counsel to the Institution, with respect to, among other matters, the corporate existence of the Institution, the power of the Institution to carry out the Series F Project (as defined in the Agreement) being financed in part by the Bonds, the power of the Institution to enter into and perform the Agreement, the authorization, execution and delivery of the Agreement by the Institution and the extent to which the Agreement is binding and enforceable upon the Institution.

We express no opinion with respect to compliance by the Institution with applicable legal requirements in connection with the construction, equipping or operation of the Series F Project.

As security for its obligations under the Agreement, the Institution has mortgaged certain real property and granted security interests in certain tangible personal property and gross receipts (as described in the Agreement). As to matters relating to title and compliance by the Institution with certain zoning, land use and related laws, and the recording of the mortgage and the filing under the Uniform Commercial Code (the "Code") with respect to the tangible personal property and receipts, reference is made to the title insurance policy issued by Ticor Title Insurance Company and to the opinion of even date of Ropes & Gray. To maintain a perfected security interest in the personal property and receipts under the Code, the Trustee must file a continuation statement every five years.

The security interest in gross receipts includes the rights of the Institution to receive the same and the proceeds of such rights. Pursuant to the Code, a security interest in these proceeds may not continue to be perfected if the proceeds are not paid over to the Trustee by the Institution within nine days of their receipt, are commingled with other funds of the Institution, or are paid by the Institution to other parties in the ordinary course. The Institution is obligated to pay over these proceeds within nine days of receipt only in the event of its earlier failure to make a required payment under the Agreement when due and until such payment has been made. In the event that the Institution fails to make a required payment when due, the Institution is obligated, to the extent necessary to make such payment, to pay over immediately to the Trustee the receipts theretofore received which have not been commingled with other funds and as to which the security interest remains perfected and to pay over to the Trustee upon receipt any proceeds thereafter received of the rights to receive the receipts.

Under the federal Bankruptcy Code, the security interest in receipts may cease to be effective to the extent derived from rights coming into existence on or after a date ninety days (or, in some circumstances, one year) prior to the filing of a petition in bankruptcy with respect to the Institution.

Based on our examination, we are of opinion, as of the date hereof and under existing law, as follows:

1. The Authority is a duly created and validly existing body corporate and politic and a public instrumentality of The Commonwealth of Massachusetts with the power to enter into and perform the Agreement and to issue the Bonds.

2. The Agreement has been duly authorized, executed and delivered by the Authority and is a valid and binding obligation of the Authority enforceable upon the Authority. As provided in Chapter 614 of the Acts of 1968 of The Commonwealth of Massachusetts, as amended, the Agreement creates a valid lien on the Revenues and on the rights of the Authority or the Trustee on behalf of the Authority to receive Revenues under the Agreement (except certain rights to indemnification, reimbursements and fees) on a parity with other bonds (if any) issued or to be issued under the Agreement.

3. The Bonds have been duly authorized, executed and delivered by the Authority and are valid and binding special obligations of the Authority, payable solely from the Revenues.

4. The Bonds are issued on a parity and equally and ratably secured with the Series D and E Bonds as to the lien on the Mortgaged Property and the lien on Gross Receipts.

5. Under existing law, interest on the Bonds (including any original issue discount properly allocable to the owners thereof) is excluded from the gross income of the owners of the Bonds for federal income tax purposes. In addition, interest on the Bonds will not be treated as a preference item in calculating the alternative minimum tax imposed under the Internal Revenue Code of 1986 (the "IRC") on individuals and corporations. However, we call your attention to the fact that interest on the Bonds will be taken into account in determining adjusted current earnings for the purpose of computing the alternative minimum tax imposed on corporations (as defined for federal income tax purposes). We also call your attention to the fact that failure by the Authority or the Institution to comply subsequent to the issuance of the Bonds with certain requirements of the IRC may cause interest on the Bonds to become includable in the gross income of the owners of the Bonds for federal income tax purposes retroactive to the date of issuance of the Bonds. The Institution and, to the extent necessary, the Authority have covenanted in the Agreement to take all lawful action necessary under the IRC to ensure that interest on the Bonds will remain excluded from the gross income of the owners of the Bonds for federal income tax purposes and to refrain from taking any action which would cause interest on the Bonds to become included in such gross income. We express no opinion regarding any other federal tax consequences arising with respect to the Bonds.

6. The income on the Bonds, including any profit made on the sale thereof, is exempt from Massachusetts personal income taxes, although the Bonds and any income thereon may be included in the measure of Massachusetts estate and inheritance taxes and of certain Massachusetts corporation excise and franchise taxes.

It is to be understood that the rights of the holders of the Bonds and the enforceability of the Bonds and the Agreement are subject to bankruptcy, insolvency, reorganization, moratorium and other similar laws affecting creditors' rights heretofore or hereafter enacted to the extent constitutionally applicable and that their enforcement may also be subject to the exercise of judicial discretion in appropriate cases.

Yours faithfully,

Financial Guaranty Insurance
Company
175 Water Street
New York, NY 10038-4972
(212) 607-3000
(800) 352-0001

A GE Capital Company

Municipal Bond
New Issue Insurance Policy

SPECIMEN

Issuer:

Policy Number:

Control Number:

Bonds:

Premium:

Financial Guaranty Insurance Company ("Financial Guaranty"), a New York stock insurance company, in consideration of the payment of the premium and subject to the terms of this Policy, hereby unconditionally and irrevocably agrees to pay to Citibank, N.A., or its successor, as its agent (the "Fiscal Agent"), for the benefit of Bondholders, that portion of the principal and interest on the above-described debt obligations (the "Bonds") which shall become Due for Payment but shall be unpaid by reason of Nonpayment by the Issuer.

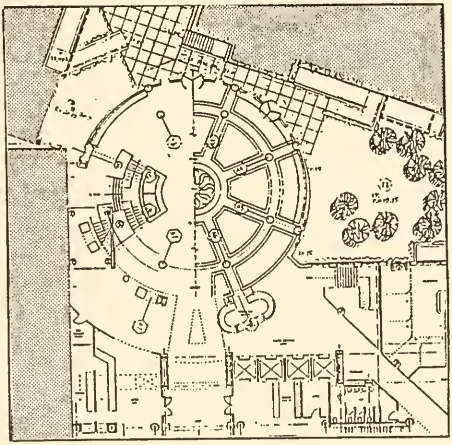
Financial Guaranty will make such payments to the Fiscal Agent on the date such principal or interest becomes Due for Payment or on the Business Day next following the day on which Financial Guaranty shall have received Notice of Nonpayment, whichever is later. The Fiscal Agent will disburse to the Bondholder the face amount of principal and interest which is then Due for Payment but is unpaid by reason of Nonpayment by the Issuer but only upon receipt by the Fiscal Agent, in form reasonably satisfactory to it, of (i) evidence of the Bondholder's right to receive payment of the principal or interest Due for Payment and (ii) evidence, including any appropriate instruments of assignment, that all of the Bondholder's rights to payment of such principal or interest Due for Payment shall thereupon vest in Financial Guaranty. Upon such disbursement, Financial Guaranty shall become the owner of the Bond, appurtenant coupon or right to payment of principal or interest on such Bond and shall be fully subrogated to all of the Bondholder's rights thereunder, including the Bondholder's right to payment thereof.

This Policy is non-cancellable for any reason. The premium on this Policy is not refundable for any reason, including the payment of the Bonds prior to their maturity. This Policy does not insure against loss of any prepayment premium which may at any time be payable with respect to any Bond.

As used herein, the term "Bondholder" means, as to a particular Bond, the person other than the Issuer who, at the time of Nonpayment, is entitled under the terms of such Bond to payment thereof. "Due for Payment" means, when referring to the principal of a Bond, the stated maturity date thereof or the date on which the same shall have been duly called for mandatory sinking fund redemption and does not refer to any earlier date on which payment is due by reason of call for redemption (other than by mandatory sinking fund redemption), acceleration or other advancement of maturity and means, when referring to interest on a

SM: Service mark used by Financial Guaranty Insurance Company under license from its parent company, FGIC Corporation

NEW ENGLAND MEDICAL
CENTER HOSPITALS



Appendix B: Public Benefits

NEW ENGLAND MEDICAL CENTER

MASTER PLAN

COMMUNITY BENEFITS PLAN

STATUS REPORT

March 3, 1992

MASTER PLAN COMMITMENTS	STATUS
1. HOUSING LINKAGE	
* Payment of 20% upfront at time of DoN or BRA approval of 1-C	* Payment of $216,000 was made on November 8
* Payment of 80% (NPV) upon the issuance of a building permit for 1-C	* Payment is anticipated to be made in October, 1992
2. JOBS LINKAGE	
* Initiation of Jobs Creation Proposal to expand ESL and training program for Chinatown residents	* Proposal will be submitted 90 days prior to building permit for 1-C (July, 1992)
3. MASTER PLAN LINKAGE	
* Commitment to single 100,000 square foot exemption for housing and jobs linkage over the course of the entire Master Plan	* Commitment has been made

4. JOB TRAINING (See charts #1 and #2)

* Commitment of $156,000 for job training over a 3 year period, with $60,000 in year 1; $63,000 in year two; and $33,000 in year 3; funds to be used to expand existing programs and initiate new programs	* Year 1 payment of $60,000 and Year 2 payment of $63,000 have been made to COTC and VACA for expansion of existing ESL, job readiness, and job training programs
* Collaboration with community agencies to evaluate the effectiveness of existing job training programs and benefits to the Asian population	* Chinatown Workplace Education initiative is now being developed with the CACA, COTC, and South Cove Manor Nursing Home; program will provide adult basic education, literacy, and ESL instruction for Nursing Home and NEMC employees; we will be advised of funding in the spring and if funded, program will begin in fall, 1992
* Collaboration with COTC to develop specialized job training programs	* Development of Biomedical Careers Training Program is now being developed with EDIC and JCS and other institutions; program began in October with 50 participants, 14% of whom are Asian
	* Collaboration with COTC has been initiated to develop new programs, specifically relating to medical secretary training program
	* Efforts to increase outreach and participation of Chinatown residents will also be pursued
* Continued participation in "Boston Summer Jobs Program"	* Participation in summer jobs program has increased over past 5 years from 22 to 84 students, with Asian representation increasing from 18% to 50%

5. AFFIRMATIVE ACTION (See charts #3-7)

* Establishment of working committee of representatives from the CNC to work with NEMC's Human Resources Department in affirmative hiring program	* A 25% increase has occurred in the number of Asian employees from 1989 to 1990 (308 to 384); and further increase to 410 up to the present * Asians comprise 7.7% of total NEMC workforce. 11.5% of all NEMC promotions were to Asian employees
* Appointment of liaison to work with the CNC and community on affirmative hiring	* Manny Berger, VP of Human Resources has been designated as liaison
* Increase in efforts to recruit youths from YES, YMCA, and Boys and Girls Clubs for employment * Provisions of on-site or off-site employment centers for affirmative action * Compliance with any and all state and municipal laws and regulations regarding affirmative action	* Advisory Committee with community representation has been established to address affirmative action, and job training program planning and development

6. PURCHASING AND CONTRACTING

* Development of purchasing and contracting program with minority-owned small businesses, including designation of individual to coordinate program, identify and maintain listing of minority-owned businesses, and establish program	* Grant was provided to AACBA to compile list of Asian-owned businesses * Director of Purchasing has been designated as liaison * May Ling Tong from Minority Business Council was hired to update policies and provide consultant services * Vendor fair, to be held on March 13, 1992, has been organized.

	Initial products to be targeted are appliances, kitchen equipment, and produce from Asian vendors
	* Advisory committee with community representation on purchasing and contracting has been formed and is comprised of members of AACBA

7. TECHNICAL ASSISTANCE FOR FUND RAISING

* Provision of technical assistance from Development Office for fund raising for economic development	* The Medical Center stands ready to provide technical assistance

8. MULTI-LINGUAL INTERPRETER SERVICE (See chart #8)

* Continuation of multi-lingual interpreter services on 24 hour a day basis and resolution of any inadequacies	* Interpreter services now meet 99% of all requests * Full-time Chinese interpreter has been employed * Translated phrase books have been developed and interpreter visits all Chinese patients * Asian specialist position has been created within Dept of Social Work Services to improve the delivery of care to Asian patients

9. SOUTH COVE COMMUNITY HEALTH CENTER

* Continuation of $180,000 annual funding	* Provision of funding in amount of $180,000 is being provided on annual basis
* Establishment of Community Hospital Program and collaborative working relationship to provide quality health care and clinical programming	* The Community Hospital Program will be established with 26 beds on the second floor of the Pratt Building when 1-C is opened

	* Advisory Committee with community representation has been established to address community health issues including participation in the planning of the community hospital program
	* Although not specifically addressed in the master plan, the following programs/affiliations have been established with SCHC: 1) an Asian caseworker has been hired to improve the coordination of services for Asian patients treated at SCHC and NEMC; 2) interested physicians at SCHC have been encouraged to enroll in the Tufts HMO, as part of the NEMC IPA; 3) a perinatal outreach worker has been trained and hired as part of NEMC's Parent to Parent program. The outreach worker will identify at-risk pregnant and parenting Asian women and seek to improve their access to perinatal services; 4) the SCHC pediatricians have been encouraged to apply for admitting privileges to the well newborn nursery which will open in July as part of NEMC's new maternity service

10. CHINESE CULTURE INSTITUTE

* Extension of lease of 4,100 square feet of space in the Tremont St. Garage for $1 per year through 1999	* Lease is being annually extended as agreed
* Initiation of good faith discussions regarding the extension of the term of the lease beyond 1999	* Not yet applicable

11. PARCEL C - COMMUNITY SERVICES CENTER

* Initiation of good faith efforts with Parcel C agencies	* Good faith efforts are now being made to facilitate Parcel C development
* Exploration of options for collaboration in the development of underground parking for Parcels A, B, and C	* NEMC and Land Use Committee to review the feasibility of this proposal, once Land Use Committee has been convened
* Provision of survey plans of Parcel C to community representatives	* Plans have been provided

12. OPEN SPACE

* Development of comprehensive open space proposal to create larger campus open space accessible to community	* Open space proposal is now being developed
* Installation of lighting and landscaping, and reasonable maintenance of park in the center divider on lower Washington Street	* Lighting and landscaping have been installed, and park is being maintained
* Determination of open space planning for compliance with Chinatown Community Plan through Article 31 process	* Not yet applicable, but will be completed with Article 31

13. PEDESTRIAN ACCESS

* Development of pedestrian walkways to integrate the campus with the surrounding community	* Development of pedestrian access plan is now being developed

14. ARCHITECTURAL/URBAN DESIGN

* Design of all buildings to blend with the architectural features of Chinatown	* Design of 1-C building is now being initiated to blend with Chinatown architectural features
* Exploration of creative means to preserve architectural identity of historic core	* Preservation of the identity of the historic core is now being explored

* Determination of compatibility of architecture and urban design of new buildings with Chinatown Community Plan through Article 31 process	* Not yet applicable, but will be completed with Article 31

15. TRANSPORTATION/TRAFFIC

* Funding of joint transportation study in cooperation with developers of Parcels A, B, and C	* Joint Study funded by NEMC and T-NEMC is nearly completed with all participants supporting the findings
* Resolution of all parking, traffic, and circulation needs	* The Joint Study is addressing all such issues

16. MONITORING

* Provision of written report every 6 months on status of community benefits	* First formal audit was completed 18 months following Master Plan approval. Ongoing updates have been presented to CNC members since Master Plan approval

New England Medical Center

Determination of Need

for New Construction

Community Health Outreach Plan

Status Report

January 16, 1992

	DoN Commitments	Status
1.	Establish an inpatient obstetric service in July 1992 which will include a division of high risk obstetrics.	Inpatient obstetric unit will open July 1992 with capacity to perform 1600-1700 deliveries. Division of high risk obstetrics has been established, with new director and new antenatal testing service.
2.	Grant staff privileges to qualified community-based pediatricians and family practitioners to discharge newborns from well-baby nursery.	This will be accomplished prior to the opening of the new obstetric unit. A series of meetings have been held and progress is being made.
3.	The Medical Center, through its physician group practice (TMCA) will provide obstetrical back-up to certified nurse midwives (CNMs) deployed at neighborhood health centers.	Since April 1991, TMCA obstetricians have been providing back-up to the 9 midwives that have been employed by St. Margaret's Hospital.
4.	Maintain coverage at Neponset, Little House and Uphams Corner Health Centers.	Obstetrician-sponsored sessions have been maintained at Neponset and Uphams Corner Health Centers. Sessions at Little House are provided by a nurse midwife which has allowed one of the TMCA obstetricians to provide back-up to all the St. Margaret's Hospital midwives.

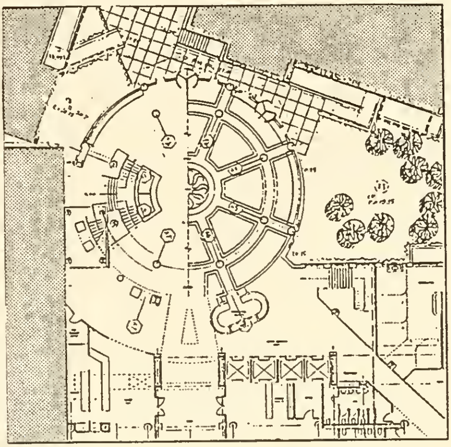
DoN Commitments	Status
5. By July 1992, recruit nurse midwives to become part of the clinical team to provide coverage at the health centers.	NEMCH will recruit and hire nurse midwives. A written pla for the establishment of a midwifery service will be prepare by May 1992. The timing must b carefully coordinated with th health centers need for additional sessions and the longer term plan for the St. Margaret's midwifery program.
6. Recruit and hire additional obstetricians to the NEMCH community group practice. Each new obstetrician will cover three clinic sessions per week.	One new obstetrician was hire September, 1991. Three new sessions are being provided--tw at Neponset and one at Bowdoi Street. Two additional obstetrician have been hired and will beg in July, 1992. One of thes obstetricians will fill a lo repayment slot awarded Geiger-Gibson and Harbor Heal Services, and will devo considerable time (approx mately half-time) to providi services at health cente located in medical underserved communities. reproductive endocrinologi will also be joining the NEM staff and, if need be, wi provide support to the heal centers.
7. The health centers targeted for additional sessions include: Bowdoin Street Health Center Codman Square Health Center Dorchester House Multi-Service Ctr. Geiger-Gibson Comm. Health Center Little House Health Center Mattapan Comm. Health Center Neponset Health Center South Boston Comm. Health Center Uphams Corner Health Center South Cove Health Center	These are the health centers where additional sessions ar being, and will be, targeted

oN Commitments	Status
. The coverage will be provided by obstetrician and nurse midwife teams with health center staff participating in protocol development.	Initial discussions with the health centers and NEMCH's new Chairman of Ob/Gyn have been held. This is an ongoing effort and will be accelerated with the development of a midwifery service.
9. NEMCH's Dept of Ob/Gyn will continue providing sessions with residents from Tufts University School of Medicine (TUSM). NEMCH obstetricians will provide back-up and will perform the deliveries.	This practice is continuing.
10. NEMCH will sponsor continuity sessions with pediatric residents at health centers. Supervising pediatricians will receive medical staff appointments at TUSM.	NEMCH is sponsoring continuity sessions with 11 pediatric residents at four health centers. These include Uphams Corner, South Boston, South Cove and Roxbury Comprehensive Health Centers. Supervising pediatricians have been granted medical staff appointments at TUSM.
11. NEMCH will identify a contact person to be responsible for compliance with these conditions and for submitting annual reports to DPH. A contact person will also be responsible for all clinical issues.	NEMCH's Director of Planning, Anne Levine, will be responsible for compliance and for submitting annual reports. On clinical issues the contact person will be the Vice-Chairman of Ob/Gyn, Robert Kennison, M.D.
12. NEMCH will establish a training program in collaboration with the ten health centers to train perinatal outreach workers. NEMCH will also fund one outreach worker at each of these health centers.	The perinatal outreach program, called Parent to Parent, is fully operational. Each participating health center has hired an outreach worker. An advisory committee comprised of the program coordinator, NEMCH staff, and health center representatives have developed a comprehensive six-week training curriculum. The outreach workers completed the training this past November. The out-

DoN Commitments	Status
	reach workers are now providin services in their communities, and ongoing monitoring and evaluation of the program is underway.
13. NEMCH will establish a program to help the health centers and their communities undertake a long-term needs assessment and monitoring of interventions.	The commitment has been made. Discussions are underway concerning the best process and structure for moving this effor forward.
14. In addition to providing South Cove Health Center (SCHC) with $180,000 annually NEMCH will also establish a case management program with SCHC and fund the position of one staff person to function as a liaison/coordinator between the two institutions and to serve as a caseworker to improve the delivery of health care to the Asian population. NEMCH also agrees to support SCHC in its efforts to establish new or expanded facilities.	NEMC has maintained its commitment to provide $180,00 annually to SCHC. The case management program ha been established and has been broadened beyond the scope of this commitment. An Asian social worker has been hired, effective this month, as a cas manager to oversee and perfor the functions described in thi commitment. In addition, an Asian specialist position has been created within NEMCH's Dep of Social Work Services and thi position has also been filled An Advisory Committee comprise of SCHC and NEMCH clinical an administrative staff has bee established to oversee this program. NEMCH has held a series of meetings with SCHC and with members of the Chinatown Neighborhood Council to discus opportunities for supporting SCHC in its efforts to secur additional space. These discussions are ongoing.

DoN Commitments	Status
15. NEMCH will fund one substance abuse outreach coordinator position for a prevention and treatment program for pregnant women, to be administered in conjunction with the health centers.	NEMCH has provided a grant to Bay Cove Substance Abuse Center for consulting services in developing this program. Bay Cove, in collaboration with the program coordinator of Parent to Parent and the health centers, is completing a needs assessment and developing a proposal with recommendations on how to best structure this new initiative. This study will be completed this spring.
16. NEMCH will provide programmatic support to the school clinic at Boston High School.	This commitment is being met.
17. NEMCH will expand its existing interpreter service by the date of licensure of the new clinical facility. Publicizing of the interpreter service, ongoing training of interpreters and medical providers, and a system for evaluating the quality of the service should all be addressed in a formalized plan and submitted to DPH.	A formal plan will be developed and submitted to DPH.
18. NEMCH will support other community and city-wide efforts to combat infant mortality.	NEMCH is participating in efforts including the Perinatal Capacity Task Force, Health Start Initiative, and hopes to participate in the Healthy Boston Coalition with its Chinatown neighbors. NEMCH also hopes to work more closely with the Maternal Health Commission in carrying out its objectives.

DoN Commitments	Status
19. NEMCH will establish a community hospital unit of at least 23 beds and shall grant admitting privileges in this unit to qualified community-based physicians.	This commitment will be kept. The community hospital unit scheduled to open in 1996, up completion of the new inpatie facility, and therefore NEMC has over three years to plan f this unit. The first step is the establishment this month of an ad-hoc committee of th Chinatown Neighborhood Counc to begin to address health issues in Chinatown. NEMCH wi also work collaboratively wi the other health centers planning for this new unit.
20. With advance request, NEMCH will provide technical assistance to BCH and to the health centers and their physicians in applying for admission to HMOs, including TAHP.	NEMCH has encouraged those health centers described ab that are not already participating in a TAHP IPA to enro their physicians in the NEMC IPA. The health centers that not already participate in t Carney IPA are Uphams Corner South Boston and South Cove. Many of the primary care physicians in these health centers are currently in the process of enrolling in the NEMCH IPA.



Appendix C: Transportation

HIGHWAY CAPACITY MANUAL
SIGNALIZATION INTERSECTION
WORKSHEETS

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HOWARD/STEIN-HUDSON ASSOCIATES    USING CINCH (VER 2.0) BY SASAKI ASSOCIATES, IN
C.                                  03-06-1992 12:01:38
ROJECT NAME: NEMC 1-C BUILDINGS DEIR  PROJECT NUMBER: 91-086  BY: jh

1985 HCM  -  CHAPTER 9:  SIGNALIZED
TUART STREET/ TREMONT STREET
UTURE BUILD CONDITIONS - AM PEAK HOUR
AST DATA SET NAMES LOADED OR SAVED
OLUME=FBSTRA       GEOMETRICS=NEMCSTR    SIGNAL=NEMCSTR
OCATED IN CBD:Y
VOLUME & GEOMETRICS
           VOLUMES       # OF LANES      LANE WIDTH      CROSS
IR  LT   TH   RT  TOTAL  LT TH RT      LT   TH    RT     WALK
B    0  669  306   975    0  3  0      0.0 11.0  0.0     61
B  207  718    0   925    1  2  0     10.0 11.0  0.0     64
B    0    0    0     0    0  0  0      0.0  0.0  0.0      0
B  216  480  308  1004    0  3  0      0.0 12.0  0.0     41

OTAL VOLUME =  2904

TRAFFIC & ROADWAY CONDITIONS
                ADJ PARK                PEDESTRIANS        ARR
IR GRADE %HV    Y/N MOVES BUSES  PHF CROSS BUT MIN TIME TYPE
B  0.0%  7.0%    N    0     0   .860   0    Y    19.0     3
B  0.0%  8.0%    Y    0     0   .930   0    Y    19.0     3
B  0.0%  0.0%    Y    0     0   .000   0         13.3     0
B  0.0% 11.0%    N    0     0   .760   0    Y    13.3     3

PHASINGS
   EASTBOUND   WESTBOUND   NORTHBOUND  SOUTHBOUND GREEN  Y+R PRE/ACT
   l  t  r  p  I  t  r  p  l  t  r  p  l  t  r  p
1     *  *     *  *                 *           *  49.1   4    A
2           *           *           *  *  *        22.9   4    A

YCLE= 80.0  LOST= 8.0  SUM V/S CRIT= 1.09 TOTAL V/C= 1.21

LEVEL OF SERVICE WORKSHEET
IR LN GROUP  v/c CM g/C    C     d1    c     d2   PF    Delay LOS Avg Q  95% Q

B  TH-RT     0.47   0.61  80.0  6.36 2656   0.00 0.85    5.41  B    9.7
B  LT        1.22 * 0.61  80.0 17.97  183 109.80 0.85  108.61  F    9.7
B  TH        0.44   0.61  80.0  6.20 1849   0.00 0.85    5.27  B    6.6
B  LT-TH-RT  1.20 * 0.29  80.0 23.55 1216  74.81 0.85   83.60  F   50.4

IR Delay LOS
B   5.41  B
B  27.53  D
B  83.60  F
INTERSECTION DELAY = 41.96 INTERSECTION LOS=E
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HOWARD/STEIN-HUDSON ASSOCIATES   USING CINCH (VER 2.0) BY SASAKI ASSOCIATES, INC.                    03-19-1
 07:55:23
PROJECT NAME: NEME 1-C BUILDINGS DEIR  PROJECT NUMBER: 91-086  BY: jh

1985 HCM - CHAPTER 9: SIGNALIZED
STUART STREET/ TREMONT STREET
FUTURE BUILD - PM PEAK HOUR
LAST DATA SET NAMES LOADED OR SAVED
VOLUME=fbstrp      GEOMETRICS=nemcstr     SIGNAL=nemcstr
LOCATED IN CBD:Y
VOLUME & GEOMETRICS
               VOLUMES           % OF LANES       LANE WIDTH        CROSS
DIR  LT    TH    RT   TOTAL   LT  TH  RT        LT    TH    RT       WALK
EB    0   845   448   1293     0   3   0       0.0  11.0   0.0       61
WB  192   846     0   1038     1   2   0      10.0  11.0   0.0       64
NB    0     0     0      0     0   0   0       0.0   0.0   0.0        0
SB  185   989   282   1456     0   3   0       0.0  12.0   0.0       41

TOTAL VOLUME =  3787

TRAFFIC & ROADWAY CONDITIONS
                  ADJ PARK                   PEDESTRIANS            ARR
DIR GRADE  %HV   Y/N MOVES BUSES   PHF  CROSS BUT MIN TIME  TYPE
EB  0.0%  7.0%    N     0     0   .860     0   Y     19.0      3
WB  0.0%  8.0%    Y     0     0   .930     0   Y     19.0      3
NB  0.0%  0.0%    Y     0     0   .000     0         13.3      0
SB  0.0% 11.0%    N     0     0   .760     0   Y     13.3      3

PHASINGS
    EASTBOUND    WESTBOUND    NORTHBOUND   SOUTHBOUND  GREEN  Y+R  PRE/ACT
    l  t  r  p  l  t  r  p  l  t  r  p  l  t  r  p
 1     *  *     *  *                 *            *  40.0    4     A
 2           *           *              *  *  *      32.0    4     A

CYCLE= 80.0  LOST= 8.0  SUM V/S CRIT= 1.90 TOTAL V/C= 2.11

LEVEL OF SERVICE WORKSHEET
DIR LN GROUP  v/c CM g/C      C      d1     c       d2    PF    Delay LOS Avg Q  95%

EB  TH-RT     0.77    0.50   80.0  12.34 2151    1.47 0.85   11.74  B  16.7
WB  LT        2.83 *  0.50   80.0  15.20   73  678.22 0.85  589.41  F  45.1
WB  TH        0.63    0.50   80.0  11.13 1506    0.67 0.85   10.03  B  10.1
SB  LT-TH-RT  1.20 *  0.40   80.0  21.06 1755   74.59 0.85   81.30  F  69.0

DIR Delay LOS
EB   11.74  B
WB  113.00  F
SB   81.30  F
INTERSECTION DELAY = 65.41 INTERSECTION LOS=F
```

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OWARD/STEIN-HUDSON ASSOCIATES    USING CINCH (VER 2.0) BY SASAKI ASSOCIATES, IN
.                                 03-06-1992 12:17:46
ROJECT NAME: NEMC 1-C BUILDINGS DEIR  PROJECT NUMBER: 91-086  BY: jh

985 HCM - CHAPTER 9: SIGNALIZED
TUART & KNEELAND STREET/ WASHINGTON STREET
UTURE BUILD CONDITIONS - AM PEAK HOUR
AST DATA SET NAMES LOADED OR SAVED
OLUME=FBKWAA     GEOMETRICS=NEMCKWA    SIGNAL=NEMCKWA
OCATED IN CBD:Y
OLUME & GEOMETRICS
            VOLUMES       # OF LANES     LANE WIDTH     CROSS
IR  LT   TH   RT  TOTAL  LT TH RT      LT    TH    RT    WALK
B  150  804   43   997    1  2  0    11.0 11.0  0.0    48
B  176  710  177  1063    0  2  1     0.0 11.0 11.0    48
B  252  392  127   771    0  2  0     0.0 12.0  0.0    36
B    0    0    0     0    0  0  0     0.0  0.0  0.0    40

OTAL VOLUME =  2831

RAFFIC & ROADWAY CONDITIONS
                ADJ PARK                PEDESTRIANS         ARR
IR GRADE %HV   Y/N MOVES BUSES  PHF CROSS BUT MIN TIME TYPE
B  0.0%  2.0%   Y    15   10   .920  200   Y    15.0    3
B  0.0%  2.0%   Y    15   10   .920  200   Y    15.0    3
B  0.0%  2.0%   Y    15   15   .920  200   Y    13.0    3
B  0.0%  0.0%   N     0    0   .000    0        13.0    0

HASINGS
   EASTBOUND   WESTBOUND   NORTHBOUND  SOUTHBOUND GREEN  Y+R PRE/ACT
   l  t  r  p  l  t  r  p  l  t  r  p  l  t  r  p
1              *  *  *                              0.0   0    A
2  *  *  *     *  *  *              *           *  43.1   4    A
3           *           *  *  *  *                 28.9   4    A

YCLE= 80.0  LOST= 8.0  SUM V/S CRIT= 0.91  TOTAL V/C= 1.01

EVEL OF SERVICE WORKSHEET
IR LN GROUP  v/c CM g/C     C     d1     c      d2   PF   Delay LOS Avg Q  95% Q

B  LT       1.03 * 0.54  80.0  14.55  158   62.62 0.85   65.59  F   4.7
B  TH-RT    0.66   0.54  80.0   9.99 1474    0.84 0.85    9.21  B   9.4
B  LT-TH    0.76   0.54  80.0  10.98 1323    2.28 0.85   11.27  B   9.9
B  RT       0.34   0.54  80.0   7.92  561    0.00 0.85    6.73  B   2.0
B  LT-TH-RT 0.98 * 0.36  80.0  19.16  902   18.56 0.85   32.06  D  15.7

IR Delay LOS
B  17.34  C
B  10.54  B
B  32.06  D
NTERSECTION DELAY = 18.83 INTERSECTION LOS=C
```

```
HOWARD/STEIN-HUDSON ASSOCIATES    USING CINCH (VER 2.0) BY SASAKI ASSOCIATES,
C.                                     03-06-1992 12:20:36
PROJECT NAME: NEMC 1-C BUILDINGS DEIR  PROJECT NUMBER: 91-086  BY: jh

1985 HCM - CHAPTER 9: SIGNALIZED
STUART & KNEELAND STREET/ WASHINGTON STREET
FUTURE BUILD CONDITIONS - PM PEAK HOUR
LAST DATA SET NAMES LOADED OR SAVED
VOLUME=FBKWAP       GEOMETRICS=NEMCKWA    SIGNAL=NEMCKWA
LOCATED IN CBD:Y
VOLUME & GEOMETRICS
             VOLUMES          # OF LANES      LANE WIDTH      CROSS
DIR  LT   TH   RT  TOTAL  LT TH RT      LT   TH    RT      WALK
EB  193  710   79   982    1  2  0    11.0 11.0   0.0      48
WB  138  861  109  1108    0  2  1     0.0 11.0  11.0      48
NB  121  194  258   573    0  2  0     0.0 12.0   0.0      36
SB    0    0    0     0    0  0  0     0.0  0.0   0.0      40

TOTAL VOLUME =  2663

TRAFFIC & ROADWAY CONDITIONS
                  ADJ PARK                PEDESTRIANS      ARR
DIR GRADE %HV    Y/N MOVES BUSES  PHF  CROSS BUT MIN TIME TYPE
EB  0.0%  2.0%    Y    15    10   .900  200   Y    15.0     3
WB  0.0%  2.0%    Y    15    10   .900  200   Y    15.0     3
NB  0.0%  2.0%    Y    15    15   .900  200   Y    13.0     3
SB  0.0%  0.0%    N     0     0   .000    0        13.0     0

PHASINGS
    EASTBOUND   WESTBOUND   NORTHBOUND  SOUTHBOUND GREEN  Y+R PRE/ACT
    l  t  r  p  l  t  r  p  l  t  r  p  l  t  r  p
 1              *  *  *                               0.0  0    A
 2  *  *  *     *  *  *              *           *   51.3  4    A
 3           *           *  *  *  *                  20.7  4    A

CYCLE= 80.0  LOST= 8.0  SUM V/S CRIT= 1.07 TOTAL V/C= 1.18

LEVEL OF SERVICE WORKSHEET
DIR LN GROUP  v/c CM g/C    C     d1    c     d2   PF    Delay LOS Avg Q  95%

EB  LT        1.23 * 0.64  80.0  18.39  175  113.84 0.85  112.40  F    9.6
EB  TH-RT     0.53   0.64  80.0   5.95 1730    0.11 0.85    5.15  B    7.0
WB  LT-TH     0.68   0.64  80.0   6.97 1709    0.92 0.85    6.70  B    8.9
WB  RT        0.18   0.64  80.0   4.44  666    0.00 0.85    3.77  A    1.0
NB  LT-TH-RT  1.08 * 0.26  80.0  23.16  619   46.60 0.85   59.30  E   18.9

DIR Delay LOS
EB  25.41  D
WB   6.43  B
NB  59.30  E
INTERSECTION DELAY = 24.84 INTERSECTION LOS=C
```

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oward/Stein-Hudson    USING CINCH (VER 2.0) BY SASAKI ASSOCIATES, INC.
                                  02-28-1992 09:01:42
ROJECT NAME: NEMC 1-C DEIR  PROJECT NUMBER: 91-086  BY: jh

1985 HCM - CHAPTER 9: SIGNALIZED
NEELAND STREET/ HARRISON AVENUE
UTURE BUILD CONDITIONS - AM PEAK HOUR
AST DATA SET NAMES LOADED OR SAVED
OLUME=FBKHRA      GEOMETRICS=NEMCKHR    SIGNAL=NEMCKHR
OCATED IN CBD:Y
/OLUME & GEOMETRICS
            VOLUMES        # OF LANES     LANE WIDTH     CROSS
IR  LT   TH   RT  TOTAL  LT TH RT      LT   TH   RT     WALK
B    0  835   96   931    0  2  1     0.0 11.0 11.0     60
B  104  885    0   989    0  3  0     0.0 11.0  0.0     60
B    0    0    0     0    0  0  0     0.0  0.0  0.0     26
B  103  146  178   427    0  1  0     0.0 12.0  0.0     26

OTAL VOLUME =  2347

TRAFFIC & ROADWAY CONDITIONS
                ADJ PARK               PEDESTRIANS       ARR
IR GRADE %HV   Y/N MOVES BUSES  PHF CROSS BUT MIN TIME TYPE
B  0.0%  2.0%   Y    10    10  .960  200   Y    18.0    3
B  0.0%  2.0%   Y    10    10  .960  200   Y    18.0    3
B  0.0%  0.0%   N    15     0  .000    0   0     9.5    3
B  0.0%  2.0%   Y     5     5  .960  200   Y     9.5    3

PHASINGS
   EASTBOUND   WESTBOUND   NORTHBOUND  SOUTHBOUND GREEN  Y+R PRE/ACT
   l  t  r  p  l  t  r  p  l  t  r  p  l  t  r  p
1     *  *     *  *                 *           *  29.8   4    A
2           *           *              *  *  *     42.2   4    A

YCLE= 80.0  LOST= 8.0  SUM V/S CRIT= 0.82 TOTAL V/C= 0.91

LEVEL OF SERVICE WORKSHEET
IR LN GROUP  v/c CM g/C    C    d1    c      d2   PF   Delay LOS Avg Q  95% Q

B  TH        0.79   0.37  80.0 16.94 1157   3.16 0.85  17.08  C  12.1
B  RT        0.25   0.37  80.0 13.18  400   0.00 0.85  11.20  B   1.4
B  LT-TH     0.91 * 0.37  80.0 18.10 1244   8.11 0.85  22.27  C  15.5
B  LT-TH-RT 0.91 * 0.53  80.0 13.00  491  16.12 0.85  24.76  C   6.3

IR Delay LOS
B  16.50  C
B  22.27  C
B  24.76  C
NTERSECTION DELAY = 20.44 INTERSECTION LOS=C
```

```
Howard/Stein-Hudson    USING CINCH (VER 2.0) BY SASAKI ASSOCIATES, INC.
                                     02-28-1992 09:06:38
PROJECT NAME: NEMC 1-C DEIR  PROJECT NUMBER: 91-086  BY: jh

1985 HCM - CHAPTER 9: SIGNALIZED
KNEELAND STREET/ HARRISON AVENUE
FUTURE BUILD CONDITIONS - PM PEAK HOUR
LAST DATA SET NAMES LOADED OR SAVED
VOLUME=FBKHRP     GEOMETRICS=NEMCKHR    SIGNAL=NEMCKHR
LOCATED IN CBD:Y
VOLUME & GEOMETRICS
             VOLUMES       # OF LANES     LANE WIDTH      CROSS
DIR  LT   TH   RT  TOTAL  LT TH RT     LT   TH    RT     WALK
EB    0  889   89   978    0  2  1    0.0 11.0 11.0      60
WB   98  916    0  1014    0  3  0    0.0 11.0  0.0      60
NB    0    0    0     0    0  0  0    0.0  0.0  0.0      26
SB  208  261  194   663    0  1  0    0.0 12.0  0.0      26

TOTAL VOLUME =  2655

TRAFFIC & ROADWAY CONDITIONS
                  ADJ PARK             PEDESTRIANS           ARR
DIR GRADE %HV    Y/N MOVES BUSES  PHF CROSS BUT MIN TIME TYPE
EB  0.0%  2.0%    Y    10    10  .950  200   Y    18.0     3
WB  0.0%  2.0%    Y    10    10  .950  200   Y    18.0     3
NB  0.0%  0.0%    N    15     0  .000    0   0     9.5     3
SB  0.0%  2.0%    Y     5     5  .950  200   Y     9.5     3

PHASINGS
    EASTBOUND   WESTBOUND   NORTHBOUND  SOUTHBOUND GREEN  Y+R PRE/ACT
    l  t  r  p  l  t  r  p  l  t  r  p  l  t  r  p
 1     *  *     *  *                 *           *  23.4   4    A
 2           *           *              *  *  *     48.6   4    A

CYCLE= 80.0  LOST= 8.0  SUM V/S CRIT= 1.10 TOTAL V/C= 1.23

LEVEL OF SERVICE WORKSHEET
DIR LN GROUP  v/c CM g/C     C     d1     c      d2    PF   Delay LOS Avg Q  95%

EB  TH        1.08   0.29  80.0  22.25  908   42.62 0.85   55.13  E  26.0
EB  RT        0.30   0.29  80.0  16.65  314    0.00 0.85   14.15  B   1.5
WB  LT-TH     1.25 * 0.29  80.0  23.95  941   93.62 0.85   99.93  F  46.9
SB  LT-TH-RT 1.21 * 0.61  80.0  17.87  575   87.78 0.85   89.80  F  25.7

DIR Delay LOS
EB  51.57  E
WB  99.93  F
SB  89.80  F
INTERSECTION DELAY = 79.88 INTERSECTION LOS=F
```

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oward/Stein-Hudson    USING CINCH (VER 2.0) BY SASAKI ASSOCIATES, INC.
                                  02-28-1992 09:13:10
ROJECT NAME: NEMC 1-C DEIR  PROJECT NUMBER: 91-086  BY: jh

985  HCM  -  CHAPTER  9:  SIGNALIZED
NEELAND STREET/ TYLER STREET
UTURE BUILD CONDITIONS - AM PEAK HOUR
AST DATA SET NAMES LOADED OR SAVED
OLUME=FBKTLA     GEOMETRICS=NEMCKTL    SIGNAL=NEMCKTL
OCATED IN CBD:Y
OLUME  &  GEOMETRICS
            VOLUMES        # OF LANES      LANE WIDTH     CROSS
IR  LT    TH    RT  TOTAL  LT  TH  RT      LT   TH   RT     WALK
B   26   970     0   996    0  2  0      0.0 11.0  0.0      60
B    0  1009    64  1073    0  2  0      0.0 11.0  0.0      60
B   17    53    90   160    0  1  0      0.0  9.0  0.0      25
B    0     0     0     0    0  0  0      0.0  0.0  0.0       0

OTAL VOLUME =  2229

RAFFIC  &  ROADWAY  CONDITIONS
                ADJ PARK                PEDESTRIANS       ARR
IR GRADE %HV    Y/N MOVES BUSES  PHF CROSS BUT MIN TIME TYPE
B  0.0% 10.0%    Y     0     0   .950    0   Y     18.0    3
B  0.0% 14.0%    Y     0     0   .900    0   Y     18.0    3
B  0.0%  5.0%    Y     0     0   .800    0   Y      9.3    3
B  0.0%  0.0%    Y     0     0   .000    0   Y      9.3    0

HASINGS
   EASTBOUND   WESTBOUND   NORTHBOUND  SOUTHBOUND GREEN  Y+R PRE/ACT
   l  t  r  p  l  t  r  p  l  t  r  p  l  t  r  p
1  *  *           *  *              *           *  51.7   4    A
2           *           *  *  *  *                 20.3   4    A

YCLE= 80.0  LOST= 8.0  SUM V/S CRIT= 0.68 TOTAL V/C= 0.76

EVEL  OF  SERVICE  WORKSHEET
IR LN GROUP  v/c CM g/C      C     d1     c      d2   PF     Delay LOS Avg Q  95% Q

B  LT-TH     0.76 * 0.65  80.0   7.48 1446    2.04 0.85    8.09  B    8.2
B  TH-RT     0.67   0.65  80.0   6.68 1876    0.74 0.85    6.31  B    9.4
B  LT-TH-RT  0.76 * 0.25  80.0  20.98  263   10.16 0.85   26.47  D    3.6

IR Delay LOS
B   8.09  B
B   6.31  B
B  26.47  D
NTERSECTION DELAY =  8.66 INTERSECTION LOS=B
```

```
Howard/Stein-Hudson    USING CINCH (VER 2.0) BY SASAKI ASSOCIATES, INC.
                                    02-28-1992 09:16:34
PROJECT NAME: NEMC 1-C DEIR  PROJECT NUMBER: 91-086  BY: jh

1985 HCM - CHAPTER 9: SIGNALIZED
KNEELAND STREET/ TYLER STREET
FUTURE BUILD CONDITIONS - PM PEAK HOUR
LAST DATA SET NAMES LOADED OR SAVED
VOLUME=FBKTLP     GEOMETRICS=NEMCKTL    SIGNAL=NEMCKTL
LOCATED IN CBD:Y
VOLUME & GEOMETRICS
             VOLUMES          # OF LANES     LANE WIDTH     CROSS
DIR  LT   TH    RT  TOTAL    LT  TH  RT     LT    TH    RT     WALK
EB   32 1058     0   1090     0   2   0    0.0  11.0   0.0     60
WB    0  950    31    981     0   2   0    0.0  11.0   0.0     60
NB   30   50   185    265     0   1   0    0.0   9.0   0.0     25
SB    0    0     0      0     0   0   0    0.0   0.0   0.0      0

TOTAL VOLUME =  2336

TRAFFIC & ROADWAY CONDITIONS
                  ADJ PARK               PEDESTRIANS          ARR
DIR GRADE  %HV    Y/N MOVES BUSES  PHF  CROSS BUT MIN TIME  TYPE
EB  0.0%   3.0%    Y     0     0   .650    0   Y     18.0      3
WB  0.0%   1.0%    Y     0     0   .980    0   Y     18.0      3
NB  0.0%   1.0%    Y     0     0   .910    0   Y      9.3      3
SB  0.0%   0.0%    Y     0     0   .000    0   Y      9.3      0

PHASINGS
    EASTBOUND   WESTBOUND   NORTHBOUND  SOUTHBOUND GREEN  Y+R PRE/ACT
    l  t  r  p  l  t  r  p  l  t  r  p  l  t  r  p
 1  *  *           *  *              *           *  50.5   4    A
 2           *           *  *  *  *                 21.5   4    A

CYCLE= 80.0  LOST= 8.0  SUM V/S CRIT= 0.95 TOTAL V/C= 1.05

LEVEL OF SERVICE WORKSHEET
DIR LN GROUP   v/c CM g/C     C      d1     c       d2    PF    Delay LOS Avg Q   95%

EB  LT-TH      1.05 * 0.63  80.0  12.34 1671   29.33 0.85   35.41  D   28.3
WB  TH-RT      0.54   0.63  80.0   6.25 1958    0.11 0.85    5.41  B    8.2
NB  LT-TH-RT   1.05 * 0.27  80.0  22.63  278   52.52 0.85   63.88  F    9.1

DIR Delay LOS
EB  35.41  D
WB   5.41  B
NB  63.88  F
INTERSECTION DELAY = 27.92 INTERSECTION LOS=D
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IOWARD/STEIN-HUDSON ASSOCIATES    USING CINCH (VER 2.0) BY SASAKI ASSOCIATES, IN
:.                                  03-06-1992 12:05:02
'ROJECT NAME: NEMC 1-C BUILDINGS DEIR  PROJECT NUMBER: 91-086  BY: jh

1985 HCM  -  CHAPTER 10:  UNSIGNALIZED
<NEELAND STREET/ HUDSON STREET   FUTURE BUILD CONDITIONS - AM PEAK HOUR

.AST DATASETS LOADED OR SAVED
'OLUME=FBKHDA     GEOMETRICS=NEMCKHD
<EY:   D
       :
    A- -B
       :
       C
3ENERAL  CHARACTERISTICS
'OPULATION GREATER THAN 250,000: YES
:ONTROLS: FROM C: YIELD FROM D: YIELD
'REVAILING SPEED:  40  MPH
1AIN STREET # OF LANES: 4 LANES
1AIN STREET APPROACH A - EXCLUSIVE RIGHT TURN LANE: NO
1AIN STREET APPROACH B - EXCLUSIVE RIGHT TURN LANE: NO

1INOR STREET LANES
                                            APPROACH: C:    D:
                          EXCLUSIVE LEFT TURN LANES: NO    NO
                         EXCLUSIVE RIGHT TURN LANES: NO    NO
.ARGE RIGHT TURN RADIUS OR SHALLOW RIGHT TURN ANGLE: YES   YES
             RIGHT TURN ACCELERATION LANE ON MAJOR: NO    NO

SIGHT  DISTANCE  RESTRICTIONS  (in  seconds)
APPROACH        A: KNEELAND    B: KNEELAND    C: HUDSON     D: HUDSON
.EFTS             0.00           0.00           0.00          0.00
THRUS             0.00           0.00           0.00          0.00
RIGHTS            0.00           0.00           0.00          0.00

VOLUMES
APPROACH        A: KNEELAND    B: KNEELAND    C: HUDSON     D: HUDSON
                 LT   TH   RT   LT   TH   RT   LT   TH   RT   LT   TH   RT
VOLUME           15 1036   14   53 1012   26    0    0    1    0    0    1
PHF               0.94           0.92           1.00          1.00
ADJ VOLUME       16 1102   15   58 1100   28    0    0    1    0    0    1
PERCENT GRADE     0.00           0.00           0.00
PASS CAR/HR      18             63              0    0    1    0    0    1

SUMMARY  OF  LEVEL  OF  SERVICE  BY  MOVEMENT
MOVEMENT                DEMAND    CAPACITY  RESERVE   LOS   AVG DEL(SEC)  AVG QUEUE
.T FROM A:                18         310       293     C       12.29         0.06
.T FROM B:                63         315       252     C       14.30         0.25

ALL MOVES FROM C:          1         850       849     A        4.24         0.00

ALL MOVES FROM D:          1         845       844     A        4.27         0.00
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HOWARD/STEIN-HUDSON ASSOCIATES    USING CINCH (VER 2.0) BY SASAKI ASSOCIATES,
C.                                  03-06-1992 12:05:02
PROJECT NAME: NEMC 1-C BUILDINGS DEIR  PROJECT NUMBER: 91-086  BY: jh

1985 HCM - CHAPTER 10: UNSIGNALIZED
KNEELAND STREET/ HUDSON STREET   FUTURE BUILD CONDITIONS - PM PEAK HOUR

LAST DATASETS LOADED OR SAVED
VOLUME=FBKHDP      GEOMETRICS=NEMCKHD
KEY:    D
        :
    A-  -B
        :
        C
GENERAL CHARACTERISTICS
POPULATION GREATER THAN 250,000: YES
CONTROLS: FROM C: YIELD FROM D: YIELD
PREVAILING SPEED:  40  MPH
MAIN STREET # OF LANES: 4 LANES
MAIN STREET APPROACH A - EXCLUSIVE RIGHT TURN LANE: NO
MAIN STREET APPROACH B - EXCLUSIVE RIGHT TURN LANE: NO

MINOR STREET LANES
                                              APPROACH: C:    D:
                                 EXCLUSIVE LEFT TURN LANES: NO    NO
                                EXCLUSIVE RIGHT TURN LANES: NO    NO
LARGE RIGHT TURN RADIUS OR SHALLOW RIGHT TURN ANGLE: YES   YES
              RIGHT TURN ACCELERATION LANE ON MAJOR: NO    NO

SIGHT DISTANCE RESTRICTIONS (in seconds
APPROACH       A: KNEELAND    B: KNEELAND    C: HUDSON      D: HUDSON
LEFTS            0.00           0.00           0.00           0.00
THRUS            0.00           0.00           0.00           0.00
RIGHTS           0.00           0.00           0.00           0.00

VOLUMES
APPROACH       A: KNEELAND    B: KNEELAND    C: HUDSON      D: HUDSON
                LT   TH   RT   LT   TH   RT   LT   TH   RT   LT   TH   RT
VOLUME          69 1096   90   70  984   44    0    0    1    0    0    1
PHF              0.89          0.95           1.00           1.00
ADJ VOLUME      78 1231  101   74 1036   46    0    0    1    0    0    1
PERCENT GRADE    0.00           0.00           0.00
PASS CAR/HR     85             81              0    0    1    0    0    1

SUMMARY OF LEVEL OF SERVICE BY MOVEMENT
MOVEMENT               DEMAND   CAPACITY  RESERVE   LOS  AVG DEL(SEC) AVG QUEL
LT FROM A:                85       330       245     C      14.70         0.35
LT FROM B:                81       234       153     D      23.50         0.53

ALL MOVES FROM C:          1       766       765     A       4.71         0.00

ALL MOVES FROM D:          1       864       863     A       4.17         0.00
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oward/Stein-Hudson    USING CINCH (VER 2.0) BY SASAKI ASSOCIATES, INC.
                                       02-28-1992 11:49:32
ROJECT NAME: NEMC 1-C DEIR  PROJECT NUMBER: 91-086  BY: jh

.985 HCM - CHAPTER 9: SIGNALIZED
NEELAND STREET/ SURFACE ARTERY
UTURE BUILD CONDITIONS - AM PEAK HOUR
AST DATA SET NAMES LOADED OR SAVED
OLUME=FBKSUA      GEOMETRICS=NEMCKSU    SIGNAL=NEMCKSU
OCATED IN CBD:Y
/OLUME & GEOMETRICS
           VOLUMES        # OF LANES      LANE WIDTH      CROSS
IR  LT   TH   RT  TOTAL  LT TH RT      LT   TH   RT      WALK
B  512  242  271  1025   1  1  1     12.0 12.0 12.0      60
B   58  630   27   715   0  3  0      0.0 12.0  0.0      60
B    0    0    0     0   0  0  0      0.0  0.0  0.0       0
B  263  761  427  1451   0  4  0      0.0 12.0  0.0      75

OTAL VOLUME =  3191

TRAFFIC & ROADWAY CONDITIONS
               ADJ PARK                PEDESTRIANS         ARR
IR GRADE %HV   Y/N MOVES BUSES  PHF CROSS BUT MIN TIME TYPE
B  0.0%  5.0%   N      0     0  .790   50   N     22.0     3
B  0.0%  5.0%   N      0     0  .790   50   N     22.0     3
B  0.0%  0.0%          0     0  .000    0         25.8     0
B  0.0%  5.0%   N      0    20  .790    0         25.8     3

PHASINGS
   EASTBOUND   WESTBOUND   NORTHBOUND  SOUTHBOUND GREEN  Y+R PRE/ACT
   l  t  r  p  l  t  r  p  l  t  r  p  l  t  r  p
1  *  *  *                                         24.6   0    A
2  *  *  *    *  *  *                              18.1   4    A
3,       *                             *  *  *     29.3   4    A

YCLE= 80.0  LOST= 8.0  SUM V/S CRIT= 0.91 TOTAL V/C= 1.01

LEVEL OF SERVICE WORKSHEET
IR LN GROUP  v/c CM g/C    C    d1    c     d2   PF   Delay LOS Avg Q  95% Q

B  LT        1.15 * 0.53  80.0 17.15  563  68.70 1.00  85.85  F  25.1
B  TH        0.36   0.53  80.0  8.18  844   0.00 0.85   6.95  B   3.2
B  RT        0.27   0.95  80.0  0.10 1276   0.00 0.85   0.09  A   0.4
B  LT-TH-RT  0.93 * 0.23  80.0 23.07 1066  11.33 0.85  29.25  D  17.3
B  LT-TH-RT  0.93 * 0.37  80.0 18.57 2164   6.50 0.85  21.31  C  27.1

IR Delay LOS
B  44.55  E
B  29.25  D
B  21.31  C
INTERSECTION DELAY = 30.13 INTERSECTION LOS=D
```

```
Howard/Stein-Hudson     USING CINCH (VER 2.0) BY SASAKI ASSOCIATES, INC.
                                     02-28-1992 12:04:29
PROJECT NAME: NEMC 1-C DEIR  PROJECT NUMBER: 91-086  BY: jh

1985 HCM  -  CHAPTER 9:  SIGNALIZED
KNEELAND STREET/ SURFACE ARTERY
FUTURE BUILD CONDITIONS - PM PEAK HOUR
LAST DATA SET NAMES LOADED OR SAVED
VOLUME=FBKSUP     GEOMETRICS=NEMCKSU    SIGNAL=NEMCKSU
LOCATED IN CBD:Y
VOLUME  &  GEOMETRICS
             VOLUMES         # OF LANES      LANE WIDTH      CROSS
DIR  LT   TH    RT   TOTAL  LT  TH  RT     LT    TH    RT     WALK
EB  712  123   262   1097    1   1   1    12.0  12.0  12.0     60
WB  111  599   185    895    0   3   0     0.0  12.0   0.0     60
NB    0    0     0      0    0   0   0     0.0   0.0   0.0      0
SB  149 1764   463   2376    0   4   0     0.0  12.0   0.0     75

TOTAL VOLUME =   4368

TRAFFIC  &  ROADWAY  CONDITIONS
                ADJ PARK                PEDESTRIANS          ARR
DIR GRADE  %HV   Y/N MOVES BUSES  PHF CROSS BUT MIN TIME TYPE
EB   0.0%  5.0%   N      0     0  .930  50   N    22.0     3
WB   0.0%  5.0%   N      0     0  .930  50   N    22.0     3
NB   0.0%  0.0%          0     0  .000   0        25.8     0
SB   0.0%  5.0%   N      0    20  .930   0        25.8     3

PHASINGS
    EASTBOUND   WESTBOUND   NORTHBOUND  SOUTHBOUND GREEN  Y+R PRE/ACT
    l  t  r  p  l  t  r  p  l  t  r  p  l  t  r  p
 1  *  *  *                                          12.0   0    A
 2  *  *  *     *  *  *                              20.0   4    A
 3        *                             *  *  *      40.0   4    A

CYCLE= 80.0  LOST= 8.0  SUM V/S CRIT= 1.05 TOTAL V/C= 1.16

LEVEL  OF  SERVICE  WORKSHEET
DIR LN GROUP  v/c CM g/C     C     d1     c      d2    PF    Delay LOS Avg Q  95%

EB  LT        2.32 * 0.40  80.0 152.89   330  468.37 1.00  621.27  F  179.0
EB  TH        0.21   0.40  80.0  11.94   632    0.00 0.85   10.15  B    1.8
EB  RT        0.22   0.95  80.0   0.10  1276    0.00 0.85    0.08  A    0.3
WB  LT-TH-RT  0.92 * 0.25  80.0  22.22  1149    9.58 0.85   27.03  D   17.4
SB  LT-TH-RT  0.94 * 0.50  80.0  14.28  3005    5.06 0.85   16.43  C   29.4

DIR Delay LOS
EB 404.39  F
WB  27.03  D
SB  16.43  C
INTERSECTION DELAY =109.30 INTERSECTION LOS=F
```

```
oward/Stein-Hudson    USING CINCH (VER 2.0) BY SASAKI ASSOCIATES, INC.
                                  03-02-1992 08:26:52
ROJECT NAME: NEMC 1-C DEIR   PROJECT NUMBER: 91-086   BY: jh

1985 HCM  -  CHAPTER 9:  SIGNALIZED
AK STREET/ TREMONT STREET & SHAWMUT AVENUE
UTURE BUILD CONDITIONS - AM PEAK HOUR
AST DATA SET NAMES LOADED OR SAVED
OLUME=FBOTRA      GEOMETRICS=nemcotr     SIGNAL=NEMCOTR
OCATED IN CBD:Y
VOLUME & GEOMETRICS
          VOLUMES          # OF LANES       LANE WIDTH       CROSS
IR   LT    TH    RT   TOTAL  LT  TH RT       LT    TH    RT     WALK
B     0   209    75    284    0   2  0       0.0 11.0   0.0     44
B    33    73     0    106    0   1  0       0.0 12.0   0.0     33
B     0     0     0      0    0   0  0       0.0  0.0   0.0      0
B    57   531   203    791    0   3  0       0.0 12.0   0.0     56

OTAL VOLUME =  1181

TRAFFIC & ROADWAY CONDITIONS
             ADJ PARK                  PEDESTRIANS          ARR
IR GRADE  %HV    Y/N MOVES BUSES  PHF  CROSS BUT MIN TIME  TYPE
B  0.0%  7.0%    N      0     0   .900    0    Y    14.0     3
B  0.0%  3.0%    N      0     0   .740    0    Y    14.0     3
B  0.0%  0.0%    Y      0     0   .000    0    Y    17.0     0
B  0.0%  8.0%    Y      0     0   .960    0    Y    17.0     3

PHASINGS
   EASTBOUND   WESTBOUND   NORTHBOUND  SOUTHBOUND GREEN  Y+R PRE/ACT
   l  t  r  p  l  t  r  p  l  t  r  p  l  t  r  p
1     *  *     *  *                 *           *  32.0   4    A
2           *           *              *  *  *     50.0   4    A

YCLE= 90.0  LOST= 8.0  SUM V/S CRIT= 0.32 TOTAL V/C= 0.35

LEVEL OF SERVICE WORKSHEET
IR LN GROUP  v/c CM g/C    C     d1    c      d2   PF    Delay LOS Avg Q  95% Q

B  TH-RT    0.32 * 0.36  90.0  16.03 1033    0.00 0.85   13.63  B    5.1
B  LT-TH    0.29   0.36  90.0  15.87  486    0.00 0.85   13.49  B    2.3
B  LT-TH-RT 0.37 * 0.56  90.0   8.49 2469    0.00 0.85    7.21  B    9.2

IR Delay LOS
B  13.63  B
B  13.49  B
B   7.21  B
INTERSECTION DELAY =  9.40 INTERSECTION LOS=B
```

```
Howard/Stein-Hudson    USING CINCH (VER 2.0) BY SASAKI ASSOCIATES, INC.
                                           03-02-1992 08:30:24
PROJECT NAME: NEMC 1-C DEIR  PROJECT NUMBER: 91-086  BY: jh

1985 HCM - CHAPTER 9: SIGNALIZED
OAK STREET/ TREMONT STREET & SHAWMUT AVENUE
FUTURE BUILD CONDITIONS - PM PEAK HOUR
LAST DATA SET NAMES LOADED OR SAVED
VOLUME=FBOTRP      GEOMETRICS=NEMCOTR    SIGNAL=NEMCOTR
LOCATED IN CBD:Y
VOLUME & GEOMETRICS
                VOLUMES         # OF LANES      LANE WIDTH      CROSS
DIR  LT   TH    RT  TOTAL     LT TH RT       LT   TH   RT      WALK
EB    0  191    54   245       0  2  0      0.0 11.0  0.0      44
WB   38  135     0   173       0  1  0      0.0 12.0  0.0      33
NB    0    0     0     0       0  0  0      0.0  0.0  0.0       0
SB   97 1163   373  1633       0  3  0      0.0 12.0  0.0      56

TOTAL VOLUME =  2051

TRAFFIC & ROADWAY CONDITIONS
                   ADJ PARK                 PEDESTRIANS        ARR
DIR GRADE %HV     Y/N MOVES BUSES   PHF CROSS BUT MIN TIME TYPE
EB   0.0%  2.0%    N     0     0   .730    0   Y    14.0     3
WB   0.0%  1.0%    N     0     0   .670    0   Y    14.0     3
NB   0.0%  0.0%    Y     0     0   .000    0   Y    17.0     0
SB   0.0%  1.0%    Y     0     0   .900    0   Y    17.0     3

PHASINGS
    EASTBOUND    WESTBOUND    NORTHBOUND   SOUTHBOUND  GREEN  Y+R PRE/ACT
    l  t  r  p  l  t  r  p  l  t  r  p  l  t  r  p
 1     *  *     *  *                 *           *   32.0    4    A
 2 ·          *           *           *  *  *        50.0    4    A

CYCLE= 90.0  LOST= 8.0  SUM V/S CRIT= 0.61 TOTAL V/C= 0.67

LEVEL OF SERVICE WORKSHEET
DIR LN GROUP  v/c CM g/C     C     d1    c      d2   PF    Delay LOS Avg Q  95%

EB  TH-RT     0.33   0.36  90.0  16.10 1066   0.00 0.85   13.68  B    5.4
WB  LT-TH     0.50 * 0.36  90.0  17.28  515   0.01 0.85   14.70  B    4.2
SB  LT-TH-RT  0.78 * 0.56  90.0  11.88 2571   1.31 0.85   11.21  B   20.2

DIR Delay LOS
EB  13.68  B
WB  14.70  B
SB  11.21  B
INTERSECTION DELAY = 11.89 INTERSECTION LOS=B
```

```
oward/Stein-Hudson    USING CINCH (VER 2.0) BY SASAKI ASSOCIATES, INC.
                                        03-02-1992 08:33:02
ROJECT NAME: NEMC 1-C DEIR  PROJECT NUMBER: 91-086  BY: jh

.985  HCM  -  CHAPTER  9:  SIGNALIZED
AK STREET/ WASHINGTON STREET
JTURE BUILD CONDITIONS - AM PEAK HOUR
AST DATA SET NAMES LOADED OR SAVED
OLUME=FBOWAA      GEOMETRICS=NEMCOWA    SIGNAL=NEMCOWA
OCATED IN CBD:Y
'OLUME  &  GEOMETRICS
            VOLUMES         # OF LANES       LANE WIDTH       CROSS
IR  LT    TH    RT   TOTAL  LT  TH  RT        LT    TH    RT      WALK
3  157    85    20    262    0   1   0       0.0 11.0  0.0       36
3    0     0     0      0    0   0   0       0.0  0.0  0.0        0
3   63   666    60    789    0   2   0       0.0 11.0  0.0       60
3    6    53    17     76    0   2   0       0.0 11.0  0.0       60

OTAL VOLUME =  1127

TRAFFIC  &  ROADWAY  CONDITIONS
                ADJ PARK                PEDESTRIANS           ARR
IR GRADE %HV    Y/N MOVES BUSES   PHF CROSS BUT MIN TIME TYPE
B  0.0%  7.0%    Y     0     0    .920    0   N     12.0    3
B  0.0%  0.0%    Y     0     0    .000    0   N     12.0    0
B  0.0%  7.0%    Y     0     0    .910    0   Y     18.0    3
B  0.0%  5.0%    Y     0     0    .810    0   Y     18.0    3

PHASINGS
   EASTBOUND    WESTBOUND    NORTHBOUND   SOUTHBOUND GREEN   Y+R PRE/ACT
   l  t  r  p  l  t  r  p  l  t  r  p  l  t  r  p
1           *              *  *  *  *     *  *  *     50.0    4    A
2  *  *  *                             *            *  22.0    4    A

YCLE= 80.0  LOST= 8.0  SUM V/S CRIT= 0.56  TOTAL V/C= 0.63

LEVEL  OF  SERVICE  WORKSHEET
IR LN GROUP  v/c CM g/C      C      d1     c       d2   PF    Delay LOS Avg Q  95% Q

B  LT-TH-RT 0.94 * 0.28  80.0  21.54   303   28.18 0.85   42.27  E    6.6
B  LT-TH-RT 0.49 * 0.63  80.0   6.17 1856    0.00 0.85    5.24  B    7.2
B  LT-TH-RT 0.07   0.63  80.0   4.46 1474    0.00 0.85    3.79  A    0.8

IR Delay LOS
B  42.27  E
B   5.24  B
B   3.79  A
NTERSECTION DELAY = 13.28 INTERSECTION LOS=B
```

```
Howard/Stein-Hudson    USING CINCH (VER 2.0) BY SASAKI ASSOCIATES, INC.
                                     03-02-1992 10:01:22
PROJECT NAME: NEMC 1-C DEIR  PROJECT NUMBER: 91-086  BY: jh

1985 HCM - CHAPTER 9: SIGNALIZED
OAK STREET/ WASHINGTON STREET
FUTURE BUILD CONDITIONS - PM PEAK HOUR
LAST DATA SET NAMES LOADED OR SAVED
VOLUME=FBOWAP    GEOMETRICS=NEMCOWA    SIGNAL=NEMCOWA
LOCATED IN CBD:Y
VOLUME & GEOMETRICS
             VOLUMES           # OF LANES     LANE WIDTH      CROSS
DIR  LT    TH    RT   TOTAL   LT  TH  RT     LT    TH    RT     WALK
EB  137   106    37    280     0   1   0     0.0  11.0  0.0     36
WB    0     0     0      0     0   0   0     0.0   0.0  0.0      0
NB  114   624    36    774     0   2   0     0.0  11.0  0.0     60
SB   62   112    37    211     0   2   0     0.0  11.0  0.0     60

TOTAL VOLUME =  1265

TRAFFIC & ROADWAY CONDITIONS
                  ADJ PARK                PEDESTRIANS          ARR
DIR GRADE  %HV    Y/N MOVES BUSES  PHF CROSS BUT MIN TIME TYPE
EB  0.0%  1.0%     Y     0     0   .760    0    N     12.0     3
WB  0.0%  0.0%     Y     0     0   .000    0    N     12.0     0
NB  0.0%  3.0%     Y     0     0   .920    0    Y     18.0     3
SB  0.0%  1.0%     Y     0     0   .840    0    Y     18.0     3

PHASINGS
    EASTBOUND    WESTBOUND    NORTHBOUND   SOUTHBOUND  GREEN   Y+R PRE/ACT
    l  t  r  p   l  t  r  p   l  t  r  p   l  t  r  p
 1           *            *   *  *  *      *  *  *       35.3   4    A
 2  *  *  *                            *            *    36.7   4    A

CYCLE= 80.0  LOST= 8.0  SUM V/S CRIT= 0.63 TOTAL V/C= 0.70

LEVEL OF SERVICE WORKSHEET
DIR LN GROUP  v/c CM g/C    C     d1     c      d2   PF    Delay LOS Avg Q  95%

EB  LT-TH-RT 0.70 * 0.46  80.0  13.11   526    3.40 0.85   14.03  B    4.4
NB  LT-TH-RT 0.71 * 0.44  80.0  13.81  1249    1.55 0.85   13.06  B   10.5
SB  LT-TH-RT 0.31   0.44  80.0  10.98   863    0.00 0.85    9.34  B    3.1

DIR Delay LOS
EB  14.03  B
NB  13.06  B
SB   9.34  B
INTERSECTION DELAY = 12.65 INTERSECTION LOS=B
```

```
DWARD/STEIN-HUDSON ASSOCIATES    USING CINCH (VER 2.0) BY SASAKI ASSOCIATES, IN
.                                  03-06-1992 12:05:02
ROJECT NAME: NEMC 1-C BUILDINGS DEIR  PROJECT NUMBER: 91-086  BY: jh

985 HCM - CHAPTER 10: UNSIGNALIZED
AK STREET/ HARRISON AVENUE   FUTURE BUILD CONDITIONS - AM PEAK HOUR

AST DATASETS LOADED OR SAVED
OLUME=FBOHRA      GEOMETRICS=NEMCOHR
EY:    D
       :
   A-  -B
       :
       C
ENERAL CHARACTERISTICS
OPULATION GREATER THAN 250,000: YES
ONTROLS: FROM C: STOP FROM D: YIELD
REVAILING SPEED:  35  MPH
AIN STREET # OF LANES: 2 LANES
AIN STREET APPROACH A - EXCLUSIVE RIGHT TURN LANE: NO
AIN STREET APPROACH B - EXCLUSIVE RIGHT TURN LANE: NO

INOR STREET LANES
                                           APPROACH: C:    D:
                          EXCLUSIVE LEFT TURN LANES: NO    NO
                         EXCLUSIVE RIGHT TURN LANES: NO    NO
ARGE RIGHT TURN RADIUS OR SHALLOW RIGHT TURN ANGLE: YES   YES
             RIGHT TURN ACCELERATION LANE ON MAJOR: NO    NO

IGHT DISTANCE RESTRICTIONS (in seconds)
PPROACH        A: HARRISON    B: HARRISON    C: OAK        D: OAK
EFTS             0.00           0.00           0.00          0.00
HRUS             0.00           0.00           0.00          0.00
IGHTS            0.00           0.00           0.00          0.00

OLUMES
PPROACH         A: HARRISON    B: HARRISON    C: OAK         D: OAK
                 LT   TH   RT   LT   TH   RT   LT   TH   RT   LT   TH   RT
OLUME            57  243    0    0    0    1    0   74   62    0    0    1
HF                0.82           1.00           0.68           1.00
DJ VOLUME        70  296    0    0    0    1    0  109   91    0    0    1
ERCENT GRADE      0.00           0.00           0.00
ASS CAR/HR       76              0              0  120  100    0    0    1

UMMARY OF LEVEL OF SERVICE BY MOVEMENT
OVEMENT                 DEMAND    CAPACITY  RESERVE    LOS  AVG DEL(SEC) AVG QUEUE
T FROM A:                 76        1285      1208      A       2.98         0.06

LL MOVES FROM C:         220         769       549      A       6.55         0.40

LL MOVES FROM D:           1        1411      1410      A       2.55         0.00
```

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HOWARD/STEIN-HUDSON ASSOCIATES    USING CINCH (VER 2.0) BY SASAKI ASSOCIATES,
C.                                        03-06-1992 12:05:02
PROJECT NAME: NEMC 1-C BUILDINGS DEIR  PROJECT NUMBER: 91-086  BY: jh

1985 HCM  —  CHAPTER 10: UNSIGNALIZED
OAK STREET/ HARRISON AVENUE   FUTURE BUILD CONDITIONS - PM PEAK HOUR

LAST DATASETS LOADED OR SAVED
VOLUME=FBOHRP      GEOMETRICS=NEMCOHR
KEY:    D
        :
     A-  -B
        :
        C
GENERAL  CHARACTERISTICS
POPULATION GREATER THAN 250,000: YES
CONTROLS: FROM C: STOP FROM D: YIELD
PREVAILING SPEED:  35  MPH
MAIN STREET # OF LANES: 2 LANES
MAIN STREET APPROACH A - EXCLUSIVE RIGHT TURN LANE: NO
MAIN STREET APPROACH B - EXCLUSIVE RIGHT TURN LANE: NO

MINOR STREET LANES
                                            APPROACH: C:    D:
                           EXCLUSIVE LEFT TURN LANES: NO    NO
                          EXCLUSIVE RIGHT TURN LANES: NO    NO
LARGE RIGHT TURN RADIUS OR SHALLOW RIGHT TURN ANGLE: YES   YES
               RIGHT TURN ACCELERATION LANE ON MAJOR: NO    NO

SIGHT  DISTANCE  RESTRICTIONS  (in  seconds
APPROACH         A: HARRISON     B: HARRISON     C: OAK          D: OAK
LEFTS              0.00            0.00            0.00            0.00
THRUS              0.00            0.00            0.00            0.00
RIGHTS             0.00            0.00            0.00            0.00

VOLUMES
APPROACH         A: HARRISON     B: HARRISON     C: OAK          D: OAK
                  LT   TH   RT    LT   TH   RT    LT   TH   RT    LT   TH   RT
VOLUME            79  481    0     0    0    1     0  137  122     0    0    1
PHF                0.80            1.00            0.79            1.00
ADJ VOLUME        99  601    0     0    0    1     0  173  154     0    0    1
PERCENT GRADE      0.00            0.00            0.00
PASS CAR/HR      109               0               0  191  170     0    0    1

SUMMARY  OF  LEVEL  OF  SERVICE  BY  MOVEMENT
MOVEMENT                DEMAND    CAPACITY  RESERVE   LOS   AVG DEL(SEC) AVG QUEU
LT FROM A:                109       1285      1176     A       3.06          0.09

ALL MOVES FROM C:         361        519       159     D      22.70          2.27

ALL MOVES FROM D:           1       1411      1410     A       2.55          0.00
```

```
-d/Stein-Hudson                          03-02-1992             BY: jh
ECT NAME: NEMC 1-C DEIR  PROJECT NUMBER: 91-086
85 HCM  -  CHAPTER 9:  SIGNALIZED
INAL ROAD/ ARLINGTON STREET
RE BUILD CONDITIONS - AM PEAK HOUR
 DATA SET NAMES LOADED OR SAVED
ME=FBMALA      GEOMETRICS=NEMCMAL      SIGNAL=NEMCMAL
TED IN CBD:Y
LUME & GEOMETRICS
                                                    LANE WIDTH         CROSS
        VOLUMES              # OF LANES        LT     TH     RT        WALK
 LT    TH     RT   TOTAL    LT  TH  RT
  0     0      0      0      0   0   0        0.0    0.0    0.0          0
 18   386      0    404      0   4   0        0.0   10.0    0.0         40
  0     0      0      0      0   0   0        0.0    0.0    0.0          0
  0   930    173   1103      0   4   1        0.0   11.0   15.0         46

AL VOLUME =  1507
RAFFIC & ROADWAY CONDITIONS
                      ADJ PARK                   PEDESTRIANS              ARR
 GRADE  %HV      Y/N MOVES BUSES   PHF   CROSS BUT MIN TIME               TYPE
 0.0%   0.0%            0     0    .000    0            13.0               0
 0.0%   6.0%      N     0     0    .880    0    Y       13.0               3
 0.0%   0.0%            0     0    .000    0            18.5               0
 0.0%   6.0%      N     0     0    .790    0    N       18.5               3

HASINGS
 EASTBOUND    WESTBOUND     NORTHBOUND    SOUTHBOUND  GREEN  Y+R  PRE/ACT
 l  t  r  p   l  t  r  p    l  t  r  p    l  t  r  p
              *  *                        *  *         32.0    4      A
                       *                               40.0    4      A

CLE= 80.0  LOST= 8.0  SUM V/S CRIT= 0.30 TOTAL V/C= 0.33
EVEL OF SERVICE WORKSHEET
R LN GROUP    v/c CM g/C      C      d1      c       d2    PF   Delay LOS Avg Q  95% Q
                                                                      
3  LT-TH     0.22 * 0.40   80.0   11.97  2349    0.00  0.85   10.18  B    6.1
3  TH        0.43 * 0.50   80.0    9.66  3041    0.00  0.85    8.21  B   13.1
3  RT        0.30   0.50   80.0    8.93   735    0.00  0.85    7.59  B    2.4

IR Delay LOS
B  10.18  B
B   8.12  B
NTERSECTION DELAY =  8.63 INTERSECTION LOS=B
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                                     03-02-1992 10:40:55
PROJECT NAME: NEMC 1-C DEIR  PROJECT NUMBER: 91-086  BY: jh

1985 HCM - CHAPTER 9: SIGNALIZED
MARGINAL ROAD/ ARLINGTON STREET
FUTURE BUILD CONDITIONS - PM PEAK HOUR
LAST DATA SET NAMES LOADED OR SAVED
VOLUME=FBMALP    GEOMETRICS=NEMCMAL    SIGNAL=NEMCMAL
LOCATED IN CBD:Y
VOLUME & GEOMETRICS
             VOLUMES         # OF LANES     LANE WIDTH      CROSS
DIR  LT   TH    RT   TOTAL   LT  TH  RT      LT   TH    RT    WALK
EB    0    0     0      0     0   0   0     0.0  0.0   0.0     0
WB   32  854     0    886     0   4   0     0.0 10.0   0.0    40
NB    0    0     0      0     0   0   0     0.0  0.0   0.0     0
SB    0 1226   264   1490     0   4   1     0.0 11.0  15.0    46

TOTAL VOLUME =  2376

TRAFFIC & ROADWAY CONDITIONS
                 ADJ PARK              PEDESTRIANS         ARR
DIR GRADE %HV   Y/N MOVES BUSES  PHF CROSS BUT MIN TIME TYPE
EB  0.0%  0.0%        0     0   .000   0          13.0     0
WB  0.0%  2.0%   N    0     0   .840   0    Y     13.0     3
NB  0.0%  0.0%        0     0   .000   0          18.5     0
SB  0.0%  2.0%   N    0     0   .640   0    N     18.5     3

PHASINGS
    EASTBOUND   WESTBOUND   NORTHBOUND   SOUTHBOUND  GREEN  Y+R PRE/ACT
    l  t  r  p  l  t  r  p  l  t  r  p  l  t  r  p
 1              *  *                                 32.0   4    A
 2                       *                 *  *      40.0   4    A

CYCLE= 80.0  LOST= 8.0  SUM V/S CRIT= 0.53 TOTAL V/C= 0.59

LEVEL OF SERVICE WORKSHEET
DIR LN GROUP  v/c CM g/C    C     d1    c      d2   PF    Delay LOS Avg Q  95%

WB  LT-TH    0.48 * 0.40  80.0  13.57 2395   0.00 0.85   11.54  B   14.1
SB  TH       0.68 * 0.50  80.0  11.51 3101   0.50 0.85   10.21  B   21.3
SB  RT       0.55   0.50  80.0  10.48  750   0.41 0.85    9.26  B    4.6

DIR Delay LOS
WB  11.54  B
SB  10.05  B
INTERSECTION DELAY = 10.52 INTERSECTION LOS=B
```

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OJECT NAME: NEMC 1-C DEIR   PROJECT NUMBER: 91-086   BY: jh

985 HCM - CHAPTER 9: SIGNALIZED
RGINAL ROAD/ TREMONT STREET
TURE BUILD CONDITIONS - AM PEAK HOUR
ST DATA SET NAMES LOADED OR SAVED
LUME=FBMTRA      GEOMETRICS=NEMCMTR     SIGNAL=NEMCMTR
CATED IN CBD:Y
OLUME & GEOMETRICS
           VOLUMES           # OF LANES        LANE WIDTH       CROSS
R  LT     TH    RT   TOTAL  LT  TH  RT       LT    TH    RT     WALK
    0      0     0      0    0   0   0       0.0   0.0   0.0      0
  175    280   399    854    0   3   1       0.0  10.0  10.0     40
   89    771     0    860    0   2   0       0.0  14.0   0.0     59
    0    200    31    231    0   2   0       0.0  10.0   0.0     56

TAL VOLUME =  1945

RAFFIC & ROADWAY CONDITIONS
                 ADJ PARK                     PEDESTRIANS          ARR
R GRADE %HV    Y/N MOVES BUSES   PHF CROSS BUT MIN TIME TYPE
  0.0%  0.0%          0     0   .000    0         13.0     0
  0.0%  6.0%    Y     0     0   .890    0    Y    13.0     3
  0.0%  5.0%    N     0     0   .910    0    Y    17.8     3
  0.0%  8.0%    Y     0     0   .860    0    Y    17.8     3

HASINGS
  EASTBOUND    WESTBOUND    NORTHBOUND   SOUTHBOUND GREEN  Y+R PRE/ACT
  l  t  r  p  l  t  r  p  l  t  r  p  l  t  r  p
              *  *  *              *              *  38.9   4    A
           *           *  *  *              *  *     33.1   4    A

CLE= 80.0  LOST= 8.0  SUM V/S CRIT= 0.66 TOTAL V/C= 0.74

EVEL OF SERVICE WORKSHEET
R LN GROUP  v/c CM g/C     C      d1     c      d2   PF    Delay LOS Avg Q  95% Q

  LT-TH     0.28   0.49  80.0   9.30 2016    0.00 0.85    7.90  B    5.8
  RT        0.74 * 0.49  80.0  12.55  606    4.02 0.85   14.09  B    5.1
  LT-TH     0.74 * 0.41  80.0  15.01 1347    1.81 0.85   14.30  B   12.3
  TH-RT     0.24   0.41  80.0  11.58 1180    0.00 0.85    9.84  B    3.5

R Delay LOS
  10.65  B
  14.30  B
   9.84  B
TERSECTION DELAY = 12.13 INTERSECTION LOS=B




STEM    USING CINCH (VER 2.0) BY SASAKI ASSOCIATES, INC.
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```
ROJECT NAME: FIRM NAME [SYSTEM]?                    HOWARD/STEIN-HUDSON ASSOCIATES  PROJ
CT NUMBER: 91-086  BY: jh

985  HCM  -  CHAPTER  9:  SIGNALIZED
ARGINAL ROAD/ TREMONT STREET
UTURE BUILD CONDITIONS - PM PEAK HOUR
AST DATA SET NAMES LOADED OR SAVED
OLUME=FBMTRP       GEOMETRICS=NEMCMTR     SIGNAL=NEMCMTR
OCATED IN CBD:Y
OLUME  &  GEOMETRICS
           VOLUMES          # OF LANES      LANE WIDTH      CROSS
IR  LT    TH    RT  TOTAL  LT  TH  RT      LT   TH   RT     WALK
B    0     0     0     0    0   0   0     0.0  0.0  0.0       0
B  146   987   428  1561    0   3   1     0.0 10.0 10.0      40
B   70   727     0   797    0   2   0     0.0 14.0  0.0      59
B    0   271    77   348    0   2   0     0.0 10.0  0.0      56

OTAL VOLUME =  2706

RAFFIC  &  ROADWAY  CONDITIONS
              ADJ PARK                   PEDESTRIANS         ARR
IR GRADE %HV  Y/N MOVES BUSES  PHF  CROSS BUT MIN TIME  TYPE
B  0.0%  0.0%        0     0   .000    0        13.0      0
B  0.0%  2.0%   Y    0     0   .800    0   Y    13.0      3
B  0.0%  6.0%   N    0     0   .760    0   Y    17.8      3
B  0.0%  2.0%   Y    0     0   .730    0   Y    17.8      3

HASINGS
   EASTBOUND    WESTBOUND    NORTHBOUND   SOUTHBOUND  GREEN  Y+R  PRE/ACT
   l  t  r  p   l  t  r  p   l  t  r  p   l  t  r  p
1               *  *  *               *            *   39.1   4     A
2            *           *  *  *             *  *      32.9   4     A

YCLE= 80.0  LOST= 8.0  SUM V/S CRIT= 0.78 TOTAL V/C= 0.86

EVEL  OF  SERVICE  WORKSHEET
IR LN GROUP   v/c CM g/C     C     d1     c     d2    PF    Delay LOS Avg Q   95% Q

B  LT-TH     0.72   0.49  80.0  12.31 2151   1.04 0.85   11.35  B   16.1
B  RT        0.86 * 0.49  80.0  13.73  621   9.63 0.85   19.86  C    6.9
B  LT-TH     0.87 * 0.41  80.0  16.39 1267   5.49 0.85   18.60  C   13.9
B  TH-RT     0.42   0.41  80.0  12.72 1192   0.00 0.85   10.82  B    6.2

IR Delay LOS
B  13.52  B
B  18.60  C
B  10.82  B
NTERSECTION DELAY = 14.67 INTERSECTION LOS=B
```

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YSTEM    USING CINCH (VER 2.0) BY SASAKI ASSOCIATES, INC.
                                  03-05-1992 14:17:19
ROJECT NAME: FIRM NAME [SYSTEM]?          HOWARD/STEIN-HUDSON ASSOCIATES  PROJ
CT NUMBER: 91-086  BY: jh

.985 HCM - CHAPTER 9: SIGNALIZED
ARGINAL ROAD/ SHAWMUT AVENUE
UTURE BUILD CONDITIONS - AM PEAK HOUR
AST DATA SET NAMES LOADED OR SAVED
OLUME=FBMSHA     GEOMETRICS=nemcmsh    SIGNAL=NEMCMSH
OCATED IN CBD:Y
'OLUME & GEOMETRICS
            VOLUMES          # OF LANES     LANE WIDTH     CROSS
IR  LT   TH   RT  TOTAL   LT TH RT      LT    TH    RT     WALK
B    0    0    0     0     0  0  0      0.0   0.0   0.0     0
B  109  602    0   711     0  2  0      0.0  12.0   0.0    44
B    0    0    0     0     0  0  0      0.0   0.0   0.0     0
B    0  393  229   622     0  3  0      0.0  12.0   0.0    52

OTAL VOLUME =  1333

'RAFFIC & ROADWAY CONDITIONS
                ADJ PARK               PEDESTRIANS          ARR
IR GRADE %HV   Y/N MOVES BUSES  PHF CROSS BUT MIN TIME TYPE
B  0.0%  0.0%   Y     0     0   .000   0   Y    14.0    0
B  0.0%  9.0%   Y     0     0   .900   0   Y    14.0    3
B  0.0%  0.0%   N     0     0   .000   0   Y    16.0    0
B  0.0%  4.0%   Y     0     0   .900   0   Y    16.0    3

'HASINGS
  EASTBOUND   WESTBOUND   NORTHBOUND   SOUTHBOUND GREEN  Y+R PRE/ACT
   l  t  r  p  l  t  r  p  l  t  r  p  l  t  r  p
1              *  *                 *           *  44.5   4     A
2 ,         *           *                 *  *     27.5   4     A

YCLE= 80.0  LOST= 8.0  SUM V/S CRIT= 0.44 TOTAL V/C= 0.49

.EVEL OF SERVICE WORKSHEET
IR LN GROUP  v/c CM g/C     C     d1    c       d2   PF    Delay LOS Avg Q  95% Q

B  LT-TH     0.49 * 0.56  80.0   8.23 1686    0.00 0.85    6.99  B    7.8
B  TH-RT     0.49 * 0.34  80.0  15.77 1545    0.00 0.85   13.41  B   10.1

IR Delay LOS
B   6.99  B
B  13.41  B
NTERSECTION DELAY = 10.06 INTERSECTION LOS=B
```

```
SYSTEM    USING CINCH (VER 2.0) BY SASAKI ASSOCIATES, INC.
                                     03-05-1992 14:19:51
PROJECT NAME: FIRM NAME [SYSTEM]?          HOWARD/STEIN-HUDSON ASSOCIATES  PR
ECT NUMBER: 91-0B6  BY: jh

1985 HCM - CHAPTER 9: SIGNALIZED
MARGINAL ROAD/ SHAWMUT AVENUE
FUTURE BUILD CONDITIONS - PM PEAK HOUR
LAST DATA SET NAMES LOADED OR SAVED
VOLUME=FBMSHP     GEOMETRICS=NEMCMSH    SIGNAL=NEMCMSH
LOCATED IN CBD:Y
VOLUME & GEOMETRICS
             VOLUMES         # OF LANES     LANE WIDTH      CROSS
DIR  LT   TH    RT  TOTAL   LT  TH  RT     LT    TH    RT     WALK
EB    0    0     0     0     0   0   0     0.0   0.0   0.0     0
WB   94  832     0   926     0   2   0     0.0  12.0   0.0    44
NB    0    0     0     0     0   0   0     0.0   0.0   0.0     0
SB    0  777   425  1202     0   3   0     0.0  12.0   0.0    52

TOTAL VOLUME =  2128

TRAFFIC & ROADWAY CONDITIONS
                  ADJ PARK               PEDESTRIANS          ARR
DIR GRADE  %HV    Y/N MOVES BUSES   PHF CROSS BUT MIN TIME TYPE
EB  0.0%  0.0%     Y     0     0   .000    0    Y    14.0     0
WB  0.0%  2.0%     Y     0     0   .880    0    Y    14.0     3
NB  0.0%  0.0%     N     0     0   .000    0    Y    16.0     0
SB  0.0%  2.0%     Y     0     0   .790    0    Y    16.0     3

PHASINGS
    EASTBOUND   WESTBOUND   NORTHBOUND  SOUTHBOUND GREEN  Y+R PRE/ACT
    l  t  r  p  l  t  r  p  l  t  r  p  l  t  r  p
 1              *  *                 *           *  35.1   4    A
 2           *           *                 *  *     36.9   4    A

CYCLE= 80.0  LOST= 8.0  SUM V/S CRIT= 0.72 TOTAL V/C= 0.80

LEVEL OF SERVICE WORKSHEET
DIR LN GROUP  v/c CM g/C     C     d1     c      d2   PF     Delay LOS Avg Q  95%

WB  LT-TH    0.80 * 0.44  80.0  14.71 1387    2.80 0.85   14.89  B   13.1
SB  TH-RT    0.80 * 0.46  80.0  13.96 2101    1.87 0.85   13.46  B   18.2

DIR Delay LOS
WB  14.89  B
SB  13.46  B
INTERSECTION DELAY = 14.03 INTERSECTION LOS=B
```

```
YSTEM    USING CINCH (VER 2.0) BY SASAKI ASSOCIATES, INC.
                                  03-05-1992 14:23:28
ROJECT NAME: FIRM NAME [SYSTEM]?            HOWARD/STEIN-HUDSON ASSOCIATES  PROJ
CT NUMBER: 91-086   BY: jh

1985 HCM - CHAPTER 9: SIGNALIZED
ARGINAL ROAD/ WASHINGTON STREET
UTURE BUILD CONDITIONS - AM PEAK HOUR
AST DATA SET NAMES LOADED OR SAVED
OLUME=FBMWAA      GEOMETRICS=NEMCMWA    SIGNAL=NEMCMWA
OCATED IN CBD:Y
VOLUME & GEOMETRICS
            VOLUMES          # OF LANES      LANE WIDTH      CROSS
IR  LT    TH    RT  TOTAL   LT TH RT       LT    TH    RT     WALK
B    0     0     0     0     0  0  0      0.0   0.0   0.0      0
B    0   102    42   144     0  2  0      0.0  12.5   0.0     22
B  544   816     0  1360     0  3  0      0.0  15.0   0.0     48
B    0     0    84    84     0  0  2      0.0   0.0  11.0     30

OTAL VOLUME =  1588

TRAFFIC & ROADWAY CONDITIONS
                ADJ PARK                  PEDESTRIANS         ARR
IR GRADE %HV    Y/N MOVES BUSES  PHF  CROSS BUT MIN TIME   TYPE
B  0.0%  0.0%          0     0   .000    0          8.5      0
B  0.0%  9.0%    Y     0     0   .900   71    Y     8.5      3
B  2.0%  7.0%    Y     0     0   .850    3    N    16.0      3
B  0.0% 18.0%    Y     0     0   .590   38    Y    16.0      3

PHASINGS
   EASTBOUND   WESTBOUND   NORTHBOUND  SOUTHBOUND GREEN  Y+R PRE/ACT
   l  t  r  p  l  t  r  p  l  t  r  p  l  t  r  p
1 '                 *  *              *            *    9.7   3    A
2            *            *  *  *              *       63.3   4    A

YCLE= 80.0  LOST= 7.0  SUM V/S CRIT= 0.42 TOTAL V/C= 0.46

LEVEL OF SERVICE WORKSHEET
IR LN GROUP  v/c CM g/C     C     d1     c       d2   PF     Delay LOS Avg Q  95% Q

B  TH-RT    0.46 * 0.12  80.0  24.88  363     0.00 0.85    21.14  C   3.1
B  LT-TH    0.46 * 0.79  80.0   2.09 3804     0.00 0.85     1.77  A   7.4
B  RT       0.09   0.79  80.0   1.42 1705     0.00 0.85     1.21  A   0.7

IR Delay LOS
B  21.14  C
B   1.77  A
B   1.21  A
NTERSECTION DELAY =  3.30 INTERSECTION LOS=A
```

```
SYSTEM    USING CINCH (VER 2.0) BY SASAKI ASSOCIATES, INC.
                                     03-05-1992 14:41:02
PROJECT NAME: FIRM NAME [SYSTEM]?              HOWARD/STEIN-HUDSON ASSOCIATES  PR
ECT NUMBER: 91-086  BY: jh

1985 HCM - CHAPTER 9: SIGNALIZED
MARGINAL ROAD/ WASHINGTON STREET
FUTURE BUILD CONDITIONS - PM PEAK HOUR
LAST DATA SET NAMES LOADED OR SAVED
VOLUME=FBMWAP      GEOMETRICS=NEMCMWA    SIGNAL=NEMCMWA
LOCATED IN CBD:Y
VOLUME & GEOMETRICS
             VOLUMES         # OF LANES     LANE WIDTH      CROSS
DIR  LT   TH   RT  TOTAL  LT TH RT       LT   TH   RT       WALK
EB    0    0    0     0    0  0  0      0.0  0.0  0.0        0
WB    0  197   65   262    0  2  0      0.0 12.5  0.0       22
NB  600  710    0  1310    0  3  0      0.0 15.0  0.0       48
SB    0    0  133   133    0  0  2      0.0  0.0 11.0       30

TOTAL VOLUME =  1705

TRAFFIC & ROADWAY CONDITIONS
                 ADJ PARK              PEDESTRIANS         ARR
DIR GRADE %HV   Y/N MOVES BUSES  PHF CROSS BUT MIN TIME TYPE
EB  0.0%  0.0%         0    0   .000   0         8.5     0
WB  0.0%  1.0%   Y     0    0   .720  75    Y    8.5     3
NB  2.0%  2.0%   Y     0    0   .960   1    N   16.0     3
SB  0.0%  1.0%   Y     0    0   .690  34    Y   16.0     3

PHASINGS
    EASTBOUND   WESTBOUND   NORTHBOUND  SOUTHBOUND GREEN  Y+R PRE/ACT
    l  t  r  p  l  t  r  p  l  t  r  p  l  t  r  p
 1                 *  *              *           *  20.7   3    A
 2           *           *  *  *              *     52.3   4    A

CYCLE= 80.0  LOST= 7.0  SUM V/S CRIT= 0.43 TOTAL V/C= 0.47

LEVEL OF SERVICE WORKSHEET
DIR LN GROUP  v/c CM g/C     C     d1     c      d2    PF    Delay LOS Avg Q   95%

WB  TH-RT    0.47 * 0.26  80.0  19.03  812    0.00 0.85   16.17  C    6.0
NB  LT-TH    0.47 * 0.65  80.0   5.26 3192    0.00 0.85    4.47  A   10.5
SB  RT       0.13   0.65  80.0   3.98 1529    0.00 0.85    3.39  A    1.5

DIR Delay LOS
WB  16.17  C
NB   4.47  A
SB   3.39  A
INTERSECTION DELAY =  6.51 INTERSECTION LOS=B
```

```
YSTEM    USING CINCH (VER 2.0) BY SASAKI ASSOCIATES, INC.
                                         03-05-1992 14:44:51
ROJECT NAME: FIRM NAME [SYSTEM]?            HOWARD/STEIN-HUDSON ASSOCIATES  PROJ
CT NUMBER: 91-086  BY: jh

.985 HCM - CHAPTER 9: SIGNALIZED
ARGINAL ROAD/ HARRISON AVEMUE
JTURE BUILD CONDITIONS - AM PEAK HOUR
AST DATA SET NAMES LOADED OR SAVED
OLUME=FBMHRA     GEOMETRICS=NEMCMHR    SIGNAL=NEMCMHR
OCATED IN CBD:Y
OLUME & GEOMETRICS
            VOLUMES           # OF LANES      LANE WIDTH      CROSS
IR  LT    TH    RT  TOTAL   LT TH RT       LT    TH    RT      WALK
3    0     0     0     0     0  0  0      0.0   0.0   0.0       0
3   18    22     0    40     0  1  0      0.0  12.0   0.0      24
3    0     0     0     0     0  0  0      0.0   0.0   0.0       0
3    0   191   116   307     0  2  0      0.0  12.0   0.0      36

OTAL VOLUME =   347

RAFFIC & ROADWAY CONDITIONS
                ADJ PARK                PEDESTRIANS          ARR
IR GRADE %HV    Y/N MOVES BUSES   PHF CROSS BUT MIN TIME TYPE
B  0.0%  0.0%    Y     0     0   .000    0   Y      9.0     0
B  0.0%  4.0%    Y     0     0   .900   82   Y      9.0     3
B  0.0%  0.0%    N     0     0   .000    0   Y     12.0     0
B  0.0%  4.0%    Y     0     0   .900    5   Y     12.0     3

HASINGS
   EASTBOUND    WESTBOUND    NORTHBOUND   SOUTHBOUND GREEN   Y+R PRE/ACT
   l  t  r  p  l  t  r  p  l  t  r  p  l  t  r  p
1 '         *           *                  *  *      56.3    4    A
2              *  *                 *            *   15.7    4    A

YCLE= 80.0  LOST= 8.0  SUM V/S CRIT= 0.15 TOTAL V/C= 0.17

EVEL OF SERVICE WORKSHEET
IR LN GROUP  v/c CM g/C     C     d1    c       d2   PF    Delay LOS Avg Q  95% Q

B  LT-TH    0.17 * 0.20  80.0  20.31  262     0.00 0.85   17.27  C    0.8
B  TH-RT    0.17 * 0.70  80.0   3.03 2109     0.00 0.85    2.58  A    2.2

IR Delay LOS
B  17.27  C
B   2.58  A
NTERSECTION DELAY =  4.20 INTERSECTION LOS=A
```

```
SYSTEM    USING CINCH (VER 2.0) BY SASAKI ASSOCIATES, INC.
                                    03-05-1992 14:47:19
PROJECT NAME: FIRM NAME [SYSTEM]?          HOWARD/STEIN-HUDSON ASSOCIATES   PRO
ECT NUMBER: 91-086  BY: jh

1985 HCM  -  CHAPTER 9:  SIGNALIZED
MARGINAL ROAD/ HARRISON AVEMUE
FUTURE BUILD CONDITIONS - PM PEAK HOUR
LAST DATA SET NAMES LOADED OR SAVED
VOLUME=FBMHRP     GEOMETRICS=NEMCMHR    SIGNAL=NEMCMHR
LOCATED IN CBD:Y
VOLUME  &  GEOMETRICS
             VOLUMES         # OF LANES      LANE WIDTH      CROSS
DIR   LT    TH    RT  TOTAL  LT  TH  RT      LT    TH    RT    WALK
EB     0     0     0     0    0   0   0     0.0   0.0   0.0     0
WB    22    30     0    52    0   1   0     0.0  12.0   0.0    24
NB     0     0     0     0    0   0   0     0.0   0.0   0.0     0
SB     0   547   170   717    0   2   0     0.0  12.0   0.0    36

TOTAL VOLUME =    769

TRAFFIC  &  ROADWAY  CONDITIONS
                  ADJ PARK                   PEDESTRIANS         ARR
DIR GRADE  %HV    Y/N MOVES BUSES   PHF  CROSS BUT MIN TIME  TYPE
EB   0.0%  0.0%    Y     0     0   .000     0   Y     9.0      0
WB   0.0%  1.0%    Y     0     0   .900    79   Y     9.0      3
NB   0.0%  0.0%    N     0     0   .000     0   Y    12.0      0
SB   0.0%  1.0%    Y     0     0   .900     2   Y    12.0      3

PHASINGS
    EASTBOUND    WESTBOUND    NORTHBOUND   SOUTHBOUND GREEN  Y+R PRE/ACT
    l  t  r  p  l  t  r  p  l  t  r  p  l  t  r  p
 1.          *           *                 *  *     62.2   4     A
 2              *  *           *              *      9.8   4     A

CYCLE= 80.0  LOST= 8.0  SUM V/S CRIT= 0.31 TOTAL V/C= 0.35

LEVEL  OF  SERVICE  WORKSHEET
DIR LN GROUF   v/c CM g/C     C     d1     c      d2   PF    Delay LOS Avg Q  95%

WB  LT-TH     0.35 * 0.12  80.0  24.43   167     0.00 0.85   20.76  C    1.1
SB  TH-RT     0.35 * 0.78  80.0   2.07 2416     0.00 0.85    1.76  A    3.9

DIR Delay LOS
WB  20.76  C
SB   1.76  A
INTERSECTION DELAY =  2.98 INTERSECTION LOS=A
```

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WARD/STEIN-HUDSON ASSOCIATES    USING CINCH (VER 2.0) BY SASAKI ASSOCIATES, IN
                                      03-05-1992 15:12:29
ROJECT NAME: NEMC 1-C BUILDINGS DEIR  PROJECT NUMBER: 91-086  BY: jh

985 HCM - CHAPTER 9: SIGNALIZED
RALD STREET/ TREMONT STREET & ARLINGTON AVENUE
TURE BUILD CONDITIONS - AM PEAK HOUR
ST DATA SET NAMES LOADED OR SAVED
LUME=FBHTRA      GEOMETRICS=NEMCHTR    SIGNAL=NEMCHTRA
CATED IN CBD:Y
OLUME & GEOMETRICS
           VOLUMES         # OF LANES      LANE WIDTH     CROSS
R  LT    TH    RT  TOTAL   LT  TH  RT      LT    TH    RT     WALK
B   74   722   138   934    0   4   0     0.0  11.0   0.0      0
B    0     0     0     0    0   0   0     0.0   0.0   0.0      0
B    0   817   367  1184    0   2   0     0.0  15.0   0.0      0
B  100   235     0   335    0   2   0     0.0  15.0   0.0      0

TAL VOLUME =  2453

RAFFIC & ROADWAY CONDITIONS
              ADJ PARK                PEDESTRIANS          ARR
R GRADE  %HV   Y/N MOVES BUSES  PHF CROSS BUT MIN TIME TYPE
B  0.0%  6.0%   N     0     0   .870    0    Y     7.0    3
B  0.0%  0.0%   N     5     0   .000    0    N     7.0    0
B  0.0%  5.0%   N     5     0   .940    0    Y     7.0    3
B  0.0% 14.0%   N     5     0   .920    0    N     7.0    3

HASINGS
  EASTBOUND   WESTBOUND   NORTHBOUND  SOUTHBOUND GREEN  Y+R PRE/ACT
  l  t  r  p  l  t  r  p  l  t  r  p  l  t  r  p
1                            *  *        *  *        48.1   4    A
2 *  *  *                                           23.9   4    A

CLE= 80.0  LOST= 8.0  SUM V/S CRIT= 0.60 TOTAL V/C= 0.66

EVEL OF SERVICE WORKSHEET
R LN GROUP  v/c CM g/C     C     d1    c      d2   PF    Delay LOS Avg Q  95% Q

B LT-TH-RT 0.66 * 0.30  80.0  18.63 1779    0.75 0.85   16.48  C  16.7
B TH-RT    0.66 * 0.60  80.0   8.06 1992    0.67 0.85    7.42  B  11.2
B LT-TH    0.34   0.60  80.0   6.07 1134    0.00 0.85    5.16  B   3.2

R Delay LOS
B 16.48  C
B  7.42  B
B  5.16  B
TERSECTION DELAY = 10.83 INTERSECTION LOS=B
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HOWARD/STEIN-HUDSON ASSOCIATES    USING CINCH (VER 2.0) BY SASAKI ASSOCIATES,
C.                                   03-05-1992 15:15:17
PROJECT NAME: NEMC 1-C BUILDINGS DEIR  PROJECT NUMBER: 91-086   BY: jh

1985 HCM - CHAPTER 9: SIGNALIZED
HERALD STREET/ TREMONT STREET & ARLINGTON AVENUE
FUTURE BUILD CONDITIONS - PM PEAK HOUR
LAST DATA SET NAMES LOADED OR SAVED
VOLUME=FBHTRP      GEOMETRICS=NEMCHTR    SIGNAL=NEMCHTRP
LOCATED IN CBD:Y
VOLUME & GEOMETRICS
             VOLUMES         # OF LANES      LANE WIDTH       CROSS
DIR  LT   TH   RT  TOTAL  LT  TH  RT       LT    TH    RT      WALK
EB   73  925  262  1260    0   4   0      0.0  11.0   0.0       0
WB    0    0    0     0    0   0   0      0.0   0.0   0.0       0
NB    0  658  134   792    0   2   0      0.0  15.0   0.0       0
SB   20  402    0   422    0   2   0      0.0  15.0   0.0       0

TOTAL VOLUME =  2474

TRAFFIC & ROADWAY CONDITIONS
                  ADJ PARK                 PEDESTRIANS           ARR
DIR GRADE %HV    Y/N MOVES BUSES  PHF  CROSS BUT MIN TIME  TYPE
EB  0.0%   2.0%   N     0    10   .940    0   Y     7.0      4
WB  0.0%   0.0%   N     5     0   .000    0   N     7.0      0
NB  0.0%   6.0%   N     5    10   .860    0   Y     7.0      3
SB  0.0%   2.0%   N     5     0   .900    0   N     7.0      3

PHASINGS
    EASTBOUND    WESTBOUND    NORTHBOUND   SOUTHBOUND  GREEN   Y+R  PRE/ACT
    l  t  r  p  l  t  r  p  l  t  r  p  l  t  r  p
 1                             *  *     *  *          39.0    4     A
 2  *  *  *                                           33.0    4     A

CYCLE= 80.0   LOST= 8.0   SUM V/S CRIT= 0.54 TOTAL V/C= 0.60

LEVEL OF SERVICE WORKSHEET
DIR LN GROUP  v/c CM g/C     C     d1    c      d2    PF    Delay LOS Avg Q  95%

EB  LT-TH-RT 0.60 * 0.41  80.0  13.94 2454   0.28 0.62    8.83  B   17.5
NB  TH-RT    0.60 * 0.49  80.0  11.30 1609   0.43 0.85    9.97  B   10.5
SB  LT-TH    0.35   0.49  80.0   9.64 1404   0.00 0.85    8.19  B    5.3

DIR Delay LOS
EB   8.83  B
NB   9.97  B
SB   8.19  B
INTERSECTION DELAY =  9.10 INTERSECTION LOS=B
```

```
DWARD/STEIN-HUDSON ASSOCIATES    USING CINCH (VER 2.0) BY SASAKI ASSOCIATES, IN
.                                     03-05-1992 15:22:28
ROJECT NAME: NEMC 1-C BUILDINGS DEIR  PROJECT NUMBER: 91-086  BY: jh

.985  HCM  —  CHAPTER 9:  SIGNALIZED
ERALD STREET/ SHAWMUT AVENUE
UTURE BUILD CONDITIONS - AM PEAK HOUR
AST DATA SET NAMES LOADED OR SAVED
DLUME=FBHSHA      GEOMETRICS=NEMCHSH    SIGNAL=NEMCHSHA
DCATED IN CBD:Y
'OLUME & GEOMETRICS
           VOLUMES          # OF LANES       LANE WIDTH      CROSS
IR  LT    TH    RT   TOTAL  LT  TH  RT     LT    TH    RT     WALK
B    0   878    89    967    0   2   0     0.0  10.0  0.0      0
B    0     0     0      0    0   0   0     0.0   0.0  0.0      0
B    0     0     0      0    0   0   0     0.0   0.0  0.0      0
B  258   173     0    431    0   3   0     0.0  14.0  0.0      0

OTAL VOLUME =   1398

TRAFFIC & ROADWAY CONDITIONS
               ADJ PARK                 PEDESTRIANS        ARR
IR GRADE %HV   Y/N MOVES BUSES  PHF CROSS BUT MIN TIME  TYPE
B  0.0% 11.0%   N      0     0   .970    0   N     7.0    4
B  0.0%  0.0%   N      5     0   .000    0   n     7.0    0
B  0.0%  0.0%   N      5     0   .000    0   n     7.0    0
B  0.0%  6.0%   N      5     0   .820    0   N     7.0    3

PHASINGS
  EASTBOUND    WESTBOUND    NORTHBOUND   SOUTHBOUND GREEN  Y+R PRE/ACT
   l  t  r  p  l  t  r  p  l  t  r  p  l  t  r  p
1     *  *                                           55.0    4    A
2                                        *  *        17.0    4    A

YCLE= 80.0  LOST= 8.0  SUM V/S CRIT= 0.49 TOTAL V/C= 0.54

LEVEL OF SERVICE WORKSHEET
IR LN GROUP  v/c CM g/C     C     d1    c      d2   PF    Delay LOS Avg Q  95% Q

B  TH-RT     0.54 * 0.69  80.0   4.73 1942    0.12 0.62    3.01  A    6.9
B  LT-TH     0.54 * 0.21  80.0  21.27 1073    0.22 0.85   18.26  C    9.2

IR Delay LOS
B   3.01  A
B  18.26  C
NTERSECTION DELAY =  8.44 INTERSECTION LOS=B
```

```
HOWARD/STEIN-HUDSON ASSOCIATES    USING CINCH (VER 2.0) BY SASAKI ASSOCIATES,
C.                                  03-05-1992 15:29:14
PROJECT NAME: NEMC 1-C BUILDINGS DEIR  PROJECT NUMBER: 91-086  BY: jh

1985 HCM - CHAPTER 9: SIGNALIZED
HERALD STREET/ SHAWMUT AVENUE
FUTURE BUILD CONDITIONS - PM PEAK HOUR
LAST DATA SET NAMES LOADED OR SAVED
VOLUME=FBHSHP      GEOMETRICS=NEMCHSH    SIGNAL=NEMCHSHP
LOCATED IN CBD:Y
VOLUME & GEOMETRICS
              VOLUMES          # OF LANES     LANE WIDTH      CROSS
DIR  LT    TH   RT   TOTAL   LT  TH  RT     LT   TH    RT      WALK
EB     0 1208   44   1252     0   2   0    0.0 10.0   0.0       0
WB     0    0    0      0     0   0   0    0.0  0.0   0.0       0
NB     0    0    0      0     0   0   0    0.0  0.0   0.0       0
SB   506  296    0    802     0   3   0    0.0 14.0   0.0       0

TOTAL VOLUME =  2054

TRAFFIC & ROADWAY CONDITIONS
                 ADJ PARK                PEDESTRIANS          ARR
DIR GRADE  %HV   Y/N MOVES BUSES   PHF  CROSS BUT MIN TIME TYPE
EB  0.0%  6.0%    N    0     0    .840    0    N     7.0     4
WB  0.0%  0.0%    N    5     0    .000    0    n     7.0     0
NB  0.0%  0.0%    N    5     0    .000    0    n     7.0     0
SB  0.0%  3.0%    N    5     0    .830    0    N     7.0     3

PHASINGS
    EASTBOUND   WESTBOUND   NORTHBOUND  SOUTHBOUND GREEN   Y+R PRE/ACT
    l  t  r  p  l  t  r  p  l  t  r  p  l  t  r  p
 1     *  *                                         51.9    4    A
 2                                      *  *        20.1    4    A

CYCLE= 80.0  LOST= 8.0  SUM V/S CRIT= 0.74 TOTAL V/C= 0.83

LEVEL OF SERVICE WORKSHEET
DIR LN GROUP  v/c CM g/C     C     d1     c      d2    PF    Delay LOS Avg Q  95%

EB  TH-RT    0.83 * 0.65  80.0   8.10 1893   2.64 0.72    7.75   B   11.7
SB  LT-TH    0.83 * 0.25  80.0  21.49 1286   3.81 0.85   21.51   C   16.1

DIR Delay LOS
EB   7.75  B
SB  21.51  C
INTERSECTION DELAY = 13.31 INTERSECTION LOS=B
```

```
WARD/STEIN-HUDSON ASSOCIATES    USING CINCH (VER 2.0) BY SASAKI ASSOCIATES, IN
                                 03-05-1992 15:33:28
OJECT NAME: NEMC 1-C BUILDINGS DEIR  PROJECT NUMBER: 91-086  BY: jh

985 HCM - CHAPTER 9: SIGNALIZED
RALD STREET/ WASHINGTON STREET
TURE BUILD CONDITIONS - AM PEAK HOUR
ST DATA SET NAMES LOADED OR SAVED
LUME=FBHWAA     GEOMETRICS=NEMCHWA    SIGNAL=NEMCHWAA
CATED IN CBD:Y
OLUME & GEOMETRICS
           VOLUMES      # OF LANES     LANE WIDTH     CROSS
R  LT   TH   RT  TOTAL  LT TH RT      LT   TH   RT    WALK
   65 1076    0  1141    1  2  0    10.0 12.0  0.0     0
    0    0  825   825    0  0  2     0.0  0.0 10.0     0
    0  552   25   577    0  3  0     0.0 11.0  0.0     0
    0    0    0     0    0  0  0     0.0  0.0  0.0     0

TAL VOLUME =  2543

RAFFIC & ROADWAY CONDITIONS
               ADJ PARK             PEDESTRIANS         ARR
R GRADE %HV   Y/N MOVES BUSES  PHF CROSS BUT MIN TIME TYPE
  0.0%  9.0%   N     0   10   .880    0   N     7.0    4
  0.0% 10.0%   N     5   10   .890    0   Y     7.0    4
  0.0%  9.0%   N     5   10   .940    0   N     7.0    3
  0.0%  0.0%   N     5    0   .000    0   N     7.0    0

HASINGS
  EASTBOUND   WESTBOUND   NORTHBOUND  SOUTHBOUND GREEN  Y+R PRE/ACT
  l  t  r  p  l  t  r  p  l  t  r  p  l  t  r  p
  *  *                                             5.6   3     A
     *              *                             47.6   4     A
                             *  *                 15.9   4     A

CLE= 80.0  LOST=11.0  SUM V/S CRIT= 0.67 TOTAL V/C= 0.77

EVEL OF SERVICE WORKSHEET
R LN GROUP  v/c CM g/C     C     d1    c      d2   PF   Delay LOS Avg Q  95% Q

  LT       0.77 * 0.07  80.0  27.82   95   26.24 1.00   54.06 E    2.2
  TH       0.60   0.70  80.0   4.68 2131    0.33 0.62    3.12 A    8.1
  RT       0.77 * 0.59  80.0   9.24 1258    2.57 0.70    8.28 B    8.3
  TH-RT    0.77 * 0.20  80.0  23.08  873    3.66 0.85   22.73 C   10.9

R Delay LOS
   5.89  B
   8.28  B
  22.73  C
TERSECTION DELAY = 10.44 INTERSECTION LOS=B
```

```
HOWARD/STEIN-HUDSON ASSOCIATES    USING CINCH (VER 2.0) BY SASAKI ASSOCIATES,
C.                                     03-05-1992 15:36:11
PROJECT NAME: NEMC 1-C BUILDINGS DEIR  PROJECT NUMBER: 91-086  BY: jh

1985 HCM - CHAPTER 9: SIGNALIZED
HERALD STREET/ WASHINGTON STREET
FUTURE BUILD CONDITIONS - PM PEAK HOUR
LAST DATA SET NAMES LOADED OR SAVED
VOLUME=FBHWAP      GEOMETRICS=NEMCHWA     SIGNAL=NEMCHWAP
LOCATED IN CBD:Y
VOLUME & GEOMETRICS
             VOLUMES            # OF LANES      LANE WIDTH       CROSS
DIR  LT   TH    RT   TOTAL   LT  TH  RT       LT    TH    RT      WALK
EB   161 1591    0   1752     1   2   0      10.0  12.0   0.0      0
WB    0     0  665    665     0   0   2       0.0   0.0  10.0      0
NB    0   575   25    600     0   3   0       0.0  11.0   0.0      0
SB    0     0    0      0     0   0   0       0.0   0.0   0.0      0

TOTAL VOLUME =  3017

TRAFFIC & ROADWAY CONDITIONS
                  ADJ PARK                  PEDESTRIANS          ARR
DIR GRADE  %HV   Y/N MOVES BUSES   PHF  CROSS BUT MIN TIME  TYPE
EB  0.0%   2.0%   N     0    10   .940    0    N      7.0     4
WB  0.0%  11.0%   N     5    10   .900    0    Y      7.0     4
NB  0.0%   6.0%   N     5    10   .860    0    N      7.0     3
SB  0.0%   0.0%   N     5     0   .000    0    N      7.0     0

PHASINGS
    EASTBOUND    WESTBOUND    NORTHBOUND   SOUTHBOUND  GREEN   Y+R PRE/ACT
    l  t  r  p  l  t  r  p  l  t  r  p  l  t  r  p
 1  *  *                                                 12.9    3     A
 2     *              *                                  39.4    4     A
 3                             *  *                      16.8    4     A

CYCLE= 80.0  LOST= 8.0  SUM V/S CRIT= 0.74 TOTAL V/C= 0.82

LEVEL OF SERVICE WORKSHEET
DIR LN GROUP  v/c CM g/C     C     d1     c      d2   PF    Delay LOS Avg Q  95%

EB  LT       0.75    0.16  80.0  24.34  229   10.68 1.00   35.02  D    3.8
EB  TH       0.82 *  0.69  80.0   6.71 2169    2.18 0.72    6.39  B   11.6
WB  RT       0.75    0.49  80.0  12.42 1036    2.57 0.69   10.34  B    8.3
NB  TH-RT    0.82 *  0.21  80.0  22.93  937    4.85 0.85   23.62  C   12.3

DIR Delay LOS
EB   8.90  B
WB  10.34  B
NB  23.62  C
INTERSECTION DELAY = 12.46 INTERSECTION LOS=B
```

```
WARD/STEIN-HUDSON ASSOCIATES    USING CINCH (VER 2.0) BY SASAKI ASSOCIATES, IN
                                       03-05-1992 15:39:13
OJECT NAME: NEMC 1-C BUILDINGS DEIR  PROJECT NUMBER: 91-086   BY: jh

985 HCM  -  CHAPTER 9:  SIGNALIZED
RALD STREET/ HARRISON AVENUE
TURE BUILD CONDITIONS - AM PEAK HOUR
ST DATA SET NAMES LOADED OR SAVED
LUME=FBHHRA      GEOMETRICS=NEMCHHR    SIGNAL=NEMCHHRA
CATED IN CBD:Y
OLUME  &  GEOMETRICS
          VOLUMES        # OF LANES       LANE WIDTH       CROSS
R  LT   TH    RT   TOTAL  LT  TH  RT      LT    TH    RT     WALK
     0  723   377   1100   0   2   0      0.0  10.0   0.0     0
   100  492     0    592   0   2   0      0.0  11.0   0.0     0
   317    0   172    489   1   0   1     13.0   0.0  13.0     0
    86  149     1    236   1   3   0     12.5  12.5   0.0     0

TAL VOLUME =  2417

RAFFIC  &  ROADWAY  CONDITIONS
                ADJ PARK                  PEDESTRIANS         ARR
R GRADE %HV   Y/N MOVES BUSES   PHF CROSS BUT MIN TIME TYPE
  0.0% 11.0%   N     0     0   .960    0    Y      7.0    4
  0.0% 16.0%   N     5     0   .900    0    Y      7.0    4
  0.0%  6.0%   Y     5     0   .890    0    Y      7.0    3
  0.0%  4.0%   N     5     0   .950    0    Y      7.0    3

HASINGS
  EASTBOUND    WESTBOUND    NORTHBOUND    SOUTHBOUND  GREEN   Y+R PRE/ACT
   l  t  r  p   l  t  r  p   l  t  r  p   l  t  r  p
      *  *      *  *                                  43.6    4     A
2                            *     *      *  *  *     28.4    4     A

CLE= 80.0  LOST= 8.0  SUM V/S CRIT= 0.72 TOTAL V/C= 0.80

EVEL  OF  SERVICE  WORKSHEET
R LN GROUP   v/c CM g/C     C     d1     c       d2    PF    Delay LOS Avg Q  95% Q

  TH-RT      0.81 * 0.54  80.0  11.29 1482     2.96 0.72   10.20  B   11.6
  LT-TH      0.74   0.54  80.0  10.57  931     2.71 0.69    9.12  B    6.7
  LT         0.78 * 0.36  80.0  17.47  458     6.96 0.85   20.77  C    5.2
  RT         0.45   0.36  80.0  15.05  429     0.00 0.85   12.80  B    2.8
  LT         0.17   0.36  80.0  13.44  545     0.00 1.00   13.44  B    1.3
  TH-RT      0.10   0.36  80.0  13.12 1718     0.00 0.85   11.15  B    2.3

R Delay LOS
  10.20  B
   9.12  B
  17.97  C
  11.93  B
TERSECTION DELAY = 11.67 INTERSECTION LOS=B
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HOWARD/STEIN-HUDSON ASSOCIATES    USING CINCH (VER 2.0) BY SASAKI ASSOCIATES,
C.                                 03-05-1992 15:42:46
PROJECT NAME: NEMC 1-C BUILDINGS DEIR  PROJECT NUMBER: 91-086  BY: jh

1985 HCM - CHAPTER 9: SIGNALIZED
HERALD STREET/ HARRISON AVENUE
FUTURE BUILD CONDITIONS - PM PEAK HOUR
LAST DATA SET NAMES LOADED OR SAVED
VOLUME=FBHHRP      GEOMETRICS=NEMCHHR    SIGNAL=NEMCHHRP
LOCATED IN CBD:Y
VOLUME & GEOMETRICS
             VOLUMES           # OF LANES      LANE WIDTH      CROSS
DIR  LT   TH   RT  TOTAL    LT TH RT       LT   TH   RT      WALK
EB    0 1155  471  1626      0  2  0      0.0 10.0  0.0       0
WB   66  357    0   423      0  2  0      0.0 11.0  0.0       0
NB  257    0  172   429      1  0  1     13.0  0.0 13.0       0
SB  178  377   15   570      1  3  0     12.5 12.5  0.0       0

TOTAL VOLUME =  3048

TRAFFIC & ROADWAY CONDITIONS
                 ADJ PARK               PEDESTRIANS         ARR
DIR GRADE %HV   Y/N MOVES BUSES  PHF CROSS BUT MIN TIME TYPE
EB  0.0% 11.0%   N     0     0  .960     0   Y      7.0    4
WB  0.0% 16.0%   N     5     0  .900     0   Y      7.0    4
NB  0.0%  6.0%   Y     5     0  .890     0   Y      7.0    3
SB  0.0%  4.0%   N     5     0  .950     0   Y      7.0    3

PHASINGS
    EASTBOUND   WESTBOUND   NORTHBOUND  SOUTHBOUND GREEN  Y+R PRE/ACT
    l  t  r  p  l  t  r  p  l  t  r  p  l  t  r  p
 1     *  *     *  *                                49.2   4     A
 2                          *     *     *  *  *     22.8   4     A

CYCLE= 80.0  LOST= 8.0  SUM V/S CRIT= 0.94 TOTAL V/C= 1.04

LEVEL OF SERVICE WORKSHEET
DIR LN GROUP  v/c CM g/C     C     d1     c      d2   PF    Delay LOS Avg Q  95%

EB  TH-RT    1.05 * 0.62  80.0  12.80 1687   29.38 0.80   33.54  D  27.7
WB  LT-TH    0.51   0.62  80.0   6.56  965    0.07 0.62    4.11  A   4.0
NB  LT       1.02 * 0.28  80.0  21.95  282   46.36 0.85   58.06  E   8.3
NB  RT       0.56   0.28  80.0  18.52  344    1.13 0.85   16.71  C   3.1
SB  LT       0.43   0.28  80.0  17.72  437    0.00 1.00   17.72  C   3.0
SB  TH-RT    0.33   0.28  80.0  17.18 1371    0.00 0.85   14.60  B   6.6

DIR Delay LOS
EB  33.54  D
WB   4.11  A
NB  41.48  E
SB  15.51  C
INTERSECTION DELAY = 26.98 INTERSECTION LOS=D
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WARD/STEIN-HUDSON ASSOCIATES    USING CINCH (VER 2.0) BY SASAKI ASSOCIATES, IN
                                   03-05-1992 15:48:52
OJECT NAME: NEMC 1-C BUILDINGS DEIR  PROJECT NUMBER: 91-086  BY: jh

985  HCM  -  CHAPTER  9:  SIGNALIZED
RALD STREET/ ALBANY STREET
TURE BUILD CONDITIONS - AM PEAK HOUR
ST DATA SET NAMES LOADED OR SAVED
LUME=FBHABA      GEOMETRICS=NEMCHABA   SIGNAL=NEMCHABA
CATED IN CBD:Y
OLUME  &  GEOMETRICS
          VOLUMES          # OF LANES       LANE WIDTH       CROSS
R  LT    TH    RT   TOTAL  LT  TH  RT      LT    TH    RT     WALK
    0   537   407    944    0   2   0     0.0  10.0   0.0      0
  145   438     0    583    0   2   0     0.0  12.0   0.0      0
    0     0     0      0    0   0   0     0.0   0.0   0.0      0
  576   681   135   1392    1   2   1    13.0  13.0  13.0      0

TAL VOLUME =  2919

RAFFIC  &  ROADWAY  CONDITIONS
              ADJ PARK                  PEDESTRIANS           ARR
R GRADE %HV    Y/N MOVES BUSES   PHF  CROSS BUT MIN TIME TYPE
  0.0% 10.0%    N     0     0   .940    0    N     7.0     3
  0.0% 25.0%    N     5     0   .810    0    Y     7.0     4
  0.0%  0.0%    N     5     0   .000    0    N     7.0     0
  0.0%  9.0%    N     5     0   .940    0    N     7.0     3

HASINGS
  EASTBOUND    WESTBOUND    NORTHBOUND   SOUTHBOUND GREEN   Y+R PRE/ACT
  l  t  r  p  l  t  r  p  l  t  r  p  l  t  r  p
                                      *  *  *      35.0    4     A
     *  *     *  *                                 37.0    4     A

CLE= 80.0  LOST= 8.0  SUM V/S CRIT= 0.83 TOTAL V/C= 0.92

EVEL  OF  SERVICE  WORKSHEET
R LN GROUP  v/c CM g/C    C     d1     c     d2    PF    Delay LOS Avg Q  95% Q

  TH-RT     0.85    0.46  80.0  14.40 1247   4.56 0.85   16.12  C  12.0
  LT-TH     0.92 *  0.46  80.0  15.29  820  12.48 0.75   20.96  C   9.7
  LT        0.92 *  0.44  80.0  16.14  665  14.57 1.00   30.71  D  10.6
  TH        0.54    0.44  80.0  12.64 1400   0.19 0.85   10.90  B   9.1
  RT        0.24    0.44  80.0  10.78  595   0.00 0.85    9.16  B   1.8

R Delay LOS
  16.12  C
  20.96  C
  18.74  C
TERSECTION DELAY = 18.41 INTERSECTION LOS=C
```

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HOWARD/STEIN-HUDSON ASSOCIATES    USING CINCH (VER 2.0) BY SASAKI ASSOCIATES,
C.                                  03-05-1992 16:08:54
PROJECT NAME: NEMC 1-C BUILDINGS DEIR  PROJECT NUMBER: 91-086   BY: jh

1985 HCM -- CHAPTER 9: SIGNALIZED
HERALD STREET/ ALBANY STREET
FUTURE BUILD CONDITIONS - PM PEAK HOUR
LAST DATA SET NAMES LOADED OR SAVED
VOLUME=FBHABP     GEOMETRICS=NEMCHABP   SIGNAL=NEMCHABP
LOCATED IN CBD:Y
VOLUME & GEOMETRICS
            VOLUMES         # OF LANES      LANE WIDTH      CROSS
DIR  LT   TH   RT  TOTAL  LT  TH  RT       LT   TH   RT     WALK
EB    0  760  843  1603    0   2   0      0.0 10.0  0.0      0
WB  106  346    0   452    0   2   0      0.0 12.0  0.0      0
NB    0    0    0     0    0   0   0      0.0  0.0  0.0      0
SB  627 1158   79  1864    1   2   1     13.0 13.0 13.0      0

TOTAL VOLUME =  3919

TRAFFIC & ROADWAY CONDITIONS
                ADJ PARK                  PEDESTRIANS        ARR
DIR GRADE %HV   Y/N MOVES BUSES  PHF  CROSS BUT MIN TIME TYPE
EB  0.0%  0.0%   N     0     0   .870   0    N     7.0     4
WB  0.0% 16.0%   N     5     0   .440   0    Y     7.0     4
NB  0.0%  0.0%   N     5     0   .000   0    N     7.0     0
SB  0.0%  7.0%   N     5     0   .930   0    N     7.0     3

PHASINGS
    EASTBOUND   WESTBOUND   NORTHBOUND  SOUTHBOUND GREEN  Y+R PRE/ACT
    l  t  r  p  l  t  r  p  l  t  r  p  l  t  r  p
 1     *  *     *  *                                56.4   4    A
 2                                      *  *  *     35.6   4    A

CYCLE=100.0  LOST= 8.0  SUM V/S CRIT= 1.13 TOTAL V/C= 1.23

LEVEL OF SERVICE WORKSHEET
DIR LN GROUP  v/c CM g/C    C     d1    c     d2   PF   Delay LOS Avg Q  95%

EB  TH-RT    1.23 * 0.56 100.0 23.67 1570  85.46 0.84  91.73  F  72.2
WB  LT-TH    1.19   0.56 100.0 21.99  906  75.60 0.83  81.08  F  36.3
SB  LT       1.23 * 0.36 100.0 28.07  547  93.88 1.00 121.94  F  35.7
SB  TH       1.13   0.36 100.0 26.44 1152  56.03 0.85  70.10  F  42.7
SB  RT       0.17   0.36 100.0 16.79  490   0.00 0.85  14.27  B   1.5

DIR Delay LOS
EB  91.73  F
WB  81.08  F
SB  84.72  F
INTERSECTION DELAY = 86.61 INTERSECTION LOS=F
```

```
WARD/STEIN-HUDSON ASSOCIATES    USING CINCH (VER 2.0) BY SASAKI ASSOCIATES, IN
                                   03-05-1992 16:21:59
OJECT NAME: NEMC 1-C BUILDINGS DEIR  PROJECT NUMBER: 91-086  BY: jh

985 HCM - CHAPTER 9: SIGNALIZED
RALD STREET/ FRONTAGE ROAD & BROADWAY BRIDGE
TURE BUILD CONDITIONS - AM PEAK HOUR
ST DATA SET NAMES LOADED OR SAVED
LUME=FBHFBA      GEOMETRICS=NEMCHFB    SIGNAL=NEMCHFB
CATED IN CBD:Y
OLUME & GEOMETRICS
           VOLUMES        # OF LANES      LANE WIDTH      CROSS
R  LT    TH    RT  TOTAL  LT  TH RT        LT    TH    RT     WALK
  166   943     0  1109    0   2  0       0.0 10.0  0.0     39
    0   606  1074  1680    0   1  1       0.0 12.0 12.0     35
   52   787   445  1284    0   2  0       0.0 12.0  0.0     26
    0     0     0     0    0   0  0       0.0  0.0  0.0      0

TAL VOLUME =  4073

RAFFIC & ROADWAY CONDITIONS
               ADJ PARK                    PEDESTRIANS          ARR
R GRADE %HV    Y/N MOVES BUSES  PHF  CROSS BUT MIN TIME  TYPE
  0.0% 11.0%    N     0      0  .890    0   N     16.8      3
  0.0% 15.0%    N     0      0  .930    0   N     16.8      3
  0.0%  1.0%    N     0      0  .900    0   N     13.5      3
  0.0%  0.0%    N     0      0  .000    0   N     13.5      0

HASINGS
  EASTBOUND    WESTBOUND    NORTHBOUND   SOUTHBOUND GREEN  Y+R PRE/ACT
  l  t  r  p  l  t  r  p  l  t  r  p  l  t  r  p
  *  *           *  *                                59.6   4    A
                          *  *  *                    32.4   4    A

CLE=100.0  LOST= 8.0  SUM V/S CRIT= 1.39 TOTAL V/C= 1.51

EVEL OF SERVICE WORKSHEET
R LN GROUP  v/c CM g/C     C     d1    c      d2   PF   Delay LOS Avg Q  95% Q

  LT-TH     1.08   0.60 100.0 17.31 1215   38.41 0.85   47.37  E  28.3
  TH        0.73   0.60 100.0 10.93  898    2.47 0.85   11.39  B   7.3
  RT        1.51 * 0.60 100.0 63.01  763  184.29 0.85  210.21  F  94.1
  LT-TH-RT  1.51 * 0.32 100.0 34.06  990  182.76 0.85  184.29  F 108.3

R Delay LOS
  47.37  E
 138.49  F
 184.29  F
TERSECTION DELAY =127.52 INTERSECTION LOS=F
```

```
HOWARD/STEIN-HUDSON ASSOCIATES    USING CINCH (VER 2.0) BY SASAKI ASSOCIATES,
C.
                                         03-05-1992 16:25:17
PROJECT NAME: NEMC 1-C BUILDINGS DEIR   PROJECT NUMBER: 91-086   BY: jh

1985 HCM -- CHAPTER 9: SIGNALIZED
HERALD STREET/ FRONTAGE ROAD & BROADWAY BRIDGE
FUTURE BUILD CONDITIONS - PM PEAK HOUR
LAST DATA SET NAMES LOADED OR SAVED
VOLUME=FBHFBP     GEOMETRICS=NEMCHFB    SIGNAL=NEMCHFB
LOCATED IN CBD:Y
VOLUME & GEOMETRICS
              VOLUMES          # OF LANES      LANE WIDTH       CROSS
DIR  LT   TH    RT   TOTAL   LT  TH  RT      LT   TH    RT      WALK
EB  213 1289     0   1502     0   2   0     0.0 10.0   0.0      39
WB    0  535  1123   1658     0   1   1     0.0 12.0  12.0      35
NB   21  565   363    949     0   2   0     0.0 12.0   0.0      26
SB    0    0     0      0     0   0   0     0.0  0.0   0.0       0

TOTAL VOLUME =  4109

TRAFFIC & ROADWAY CONDITIONS
                ADJ PARK                PEDESTRIANS           ARR
DIR GRADE  %HV   Y/N MOVES BUSES  PHF  CROSS BUT MIN TIME  TYPE
EB  0.0%  4.0%    N     0     0   .980    0    N    16.8      3
WB  0.0%  2.0%    N     0     0   .930    0    N    16.8      3
NB  0.0%  3.0%    N     0     0   .870    0    N    13.5      3
SB  0.0%  0.0%    N     0     0   .000    0    N    13.5      0

PHASINGS
    EASTBOUND   WESTBOUND   NORTHBOUND  SOUTHBOUND GREEN  Y+R PRE/ACT
    l  t  r  p  l  t  r  p  l  t  r  p  l  t  r  p
 1  *  *           *  *                              64.3   4    A
 2                          *  *  *                  27.7   4    A

CYCLE=100.0  LOST= 8.0  SUM V/S CRIT= 1.27 TOTAL V/C= 1.38

LEVEL OF SERVICE WORKSHEET
DIR LN GROUP  v/c CM g/C      C     d1     c      d2    PF    Delay LOS Avg Q  95%

EB  LT-TH    1.08   0.64 100.0  15.82 1491   37.50 0.85   45.33  E   32.7
WB  TH       0.56   0.64 100.0   7.53 1032    0.35 0.85    6.70  B    5.7
WB  RT       1.38 * 0.64 100.0  42.26  877  137.23 0.85  152.56  F   72.5
NB  LT-TH-RT 1.38 * 0.28 100.0  32.11  832  137.59 0.85  144.24  F   67.8

DIR Delay  LOS
EB   45.33  E
WB 105.50  F
NB 144.24  F
INTERSECTION DELAY = 93.94  INTERSECTION LOS=F
```

```
WARD/STEIN-HUDSON ASSOCIATES    USING CINCH (VER 2.0) BY SASAKI ASSOCIATES, IN
                                     03-05-1992 16:42:37
OJECT NAME: NEMC 1-C BUILDINGS DEIR  PROJECT NUMBER: 91-086  BY: jh

985 HCM  -  CHAPTER 9:  SIGNALIZED
 BERKELEY STREET AT TREMONT STREET
TURE BUILD CONDITIONS - AM PEAK HOUR
ST DATA SET NAMES LOADED OR SAVED
LUME=FBBTRA      GEOMETRICS=NEMCBTR    SIGNAL=NEMCBTRA
CATED IN CBD:Y
OLUME  &  GEOMETRICS
          VOLUMES         # OF LANES      LANE WIDTH      CROSS
R  LT    TH    RT   TOTAL  LT  TH  RT     LT    TH    RT     WALK
B   22     0    14     36   0   1   0    0.0  12.0   0.0      0
B  257  1177   333   1767   0   3   0    0.0  11.0   0.0      0
B  197   763     0    960   0   2   0    0.0  11.0   0.0      0
B    0   351   109    460   0   2   0    0.0  12.0   0.0      0

TAL VOLUME =  3223

RAFFIC  &  ROADWAY  CONDITIONS
              ADJ  PARK                    PEDESTRIANS        ARR
R GRADE  %HV   Y/N MOVES BUSES  PHF  CROSS BUT MIN TIME  TYPE
B  0.0%   7.0%   Y     5     0   .750    0   N     7.0     3
B  0.0%   3.0%   N     5     0   .930    0   N     7.0     4
B  0.0%   5.0%   Y     5     0   .920    0   Y     7.0     3
B  0.0%  13.0%   Y     5     0   .860    0   Y     7.0     3

HASINGS
  EASTBOUND    WESTBOUND    NORTHBOUND   SOUTHBOUND  GREEN  Y+R  PRE/ACT
  l  t  r  p  l  t  r  p  l  t  r  p  l  t  r  p
1                          *  *                        9.8    3     A
2                          *  *              *  *     31.0    4     A
3 . *     *     *  *  *                               48.2    4     A

CLE=100.0  LOST= 8.0  SUM V/S CRIT= 0.92  TOTAL V/C= 1.00

EVEL  OF  SERVICE  WORKSHEET
R LN GROUP  v/c CM g/C      C      d1      c      d2    PF    Delay  LOS  Avg Q  95% Q

B  LT-RT     1.03 * 0.48 100.0  20.25    47  109.78 0.85  110.53   F    2.3
B  LT-TH-RT  0.97   0.48 100.0  19.16  2153   10.27 0.77   22.67   C   29.2
B  LT-TH     0.97 * 0.44 100.0  20.89  1129   15.55 0.85   30.97   D   19.8
B  TH-RT     0.66   0.31 100.0  22.73   853    1.49 0.85   20.59   C   10.3

R Delay  LOS
B 110.53  F
B  22.67  C
B  30.97  D
B  20.59  C
NTERSECTION DELAY = 25.87 INTERSECTION LOS=D
```

```
HOWARD/STEIN-HUDSON ASSOCIATES    USING CINCH (VER 2.0) BY SASAKI ASSOCIATES,
C.                                          03-05-1992 16:46:02
PROJECT NAME: NEMC 1-C BUILDINGS DEIR  PROJECT NUMBER: 91-086  BY: jh

1985 HCM — CHAPTER 9: SIGNALIZED
E.BERKELEY STREET/ TREMONT STREET
FUTURE BUILD CONDITIONS - PM PEAK HOUR
LAST DATA SET NAMES LOADED OR SAVED
VOLUME=FBBTRP      GEOMETRICS=NEMCBTR    SIGNAL=NEMCBTRP
LOCATED IN CBD:Y
VOLUME & GEOMETRICS
             VOLUMES         # OF LANES      LANE WIDTH       CROSS
DIR  LT   TH   RT  TOTAL  LT TH RT      LT    TH    RT      WALK
EB    20    0   14    34    0  1  0     0.0 12.0  0.0        0
WB   355  800  226  1381    0  3  0     0.0 11.0  0.0        0
NB   182  437    0   619    0  2  0     0.0 11.0  0.0        0
SB     0  482  113   595    0  2  0     0.0 12.0  0.0        0

TOTAL VOLUME =  2629

TRAFFIC & ROADWAY CONDITIONS
                  ADJ PARK                 PEDESTRIANS          ARR
DIR GRADE %HV   Y/N MOVES BUSES  PHF  CROSS BUT MIN TIME TYPE
EB   0.0%  2.0%   Y     5     0   .900    0   N      7.0    3
WB   0.0%  2.0%   N     5     0   .900    0   N      7.0    3
NB   0.0%  2.0%   Y     5     0   .900    0   Y      7.0    3
SB   0.0%  2.0%   Y     5     0   .900    0   Y      7.0    3

PHASINGS
    EASTBOUND   WESTBOUND   NORTHBOUND  SOUTHBOUND GREEN  Y+R PRE/ACT
    l  t  r  p  l  t  r  p  l  t  r  p  l  t  r  p
 1                          *  *                     2.5   3    A
 2 .                        *  *           *  *     33.3   4    A
 3  *     *     *  *  *                             53.2   4    A

CYCLE=100.0  LOST= 8.0  SUM V/S CRIT= 0.72 TOTAL V/C= 0.79

LEVEL OF SERVICE WORKSHEET
DIR LN GROUP  v/c CM g/C    C     d1     c     d2   PF    Delay LOS Avg Q  95%

EB  LT-RT     0.79 * 0.53 100.0  14.40   48   49.02 0.85   53.90  E    1.0
WB  LT-TH-RT  0.71   0.53 100.0  13.35 2384    0.82 0.85   12.05  B   19.9
NB  LT-TH     0.77 * 0.39 100.0  20.34  933    3.44 0.85   20.21  C   11.7
SB  TH-RT     0.71   0.33 100.0  22.21  971    2.10 0.85   20.66  C   12.3

DIR Delay LOS
EB  53.90  E
WB  12.05  B
NB  20.21  C
SB  20.66  C
INTERSECTION DELAY = 16.33 INTERSECTION LOS=C
```

```
WARD/STEIN-HUDSON ASSOCIATES    USING CINCH (VER 2.0) BY SASAKI ASSOCIATES, IN
                                      03-05-1992 16:49:02
OJECT NAME: NEMC 1-C BUILDINGS DEIR  PROJECT NUMBER: 91-086  BY: jh

985 HCM - CHAPTER 9: SIGNALIZED
BERKELEY STREET/ SHAWMUT AVENUE
TURE BUILD CONDITIONS - AM PEAK HOUR
ST DATA SET NAMES LOADED OR SAVED
LUME=FBBSHA      GEOMETRICS=NEMCBSH    SIGNAL=NEMCBTRP
CATED IN CBD:Y
OLUME & GEOMETRICS
           VOLUMES         # OF LANES     LANE WIDTH      CROSS
R  LT    TH    RT  TOTAL  LT  TH  RT      LT    TH    RT    WALK
    0     0     0      0   0   0   0     0.0   0.0   0.0    35
    0  1469     0   1469   0   3   0     0.0  11.0   0.0    34
  162     0     0    162   2   0   0    15.0   0.0   0.0    62
    0     0   140    140   0   0   2     0.0   0.0  12.0    40

TAL VOLUME =  1771

RAFFIC & ROADWAY CONDITIONS
               ADJ PARK                 PEDESTRIANS          ARR
R GRADE %HV    Y/N MOVES BUSES  PHF CROSS BUT MIN TIME  TYPE
  0.0%  0.0%         0     0   .000    0          15.8    0
  0.0%  4.0%    N    0     0   .940    0    Y     15.8    3
  0.0%  1.0%    Y    0     0   .900    0    Y     22.5    3
  0.0%  6.0%    Y    0     0   .760    0    Y     22.5    3

HASINGS
  EASTBOUND   WESTBOUND   NORTHBOUND  SOUTHBOUND GREEN  Y+R PRE/ACT
  l  t  r  p  l  t  r  p  l  t  r  p  l  t  r  p
                          *  *                        1.0   3    A
                          *  *           *  *        12.2   4    A
  *     *     *  *  *                                55.7   4    A

CLE= 80.0  LOST=11.0  SUM V/S CRIT= 0.46 TOTAL V/C= 0.53

EVEL OF SERVICE WORKSHEET
R LN GROUP  v/c CM g/C     C     d1    c       d2   PF    Delay LOS Avg Q  95% Q

  TH        0.54 * 0.70  80.0   4.47 3208     0.07 0.85    3.86  A   10.5
  LT        0.46 * 0.20  80.0  21.26  394     0.00 1.00   21.26  C    3.9
  RT        0.54 * 0.15  80.0  23.76  361     0.59 0.85   20.70  C    3.5

R Delay LOS
   3.86  A
  21.26  C
  20.70  C
TERSECTION DELAY =  6.97 INTERSECTION LOS=B
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```
HOWARD/STEIN-HUDSON ASSOCIATES    USING CINCH (VER 2.0) BY SASAKI ASSOCIATES,
C.                                     03-05-1992 16:53:31
PROJECT NAME: NEMC 1-C BUILDINGS DEIR  PROJECT NUMBER: 91-086  BY: jh

1985 HCM  -  CHAPTER 9:  SIGNALIZED
E.BERKELEY STREET/ SHAWMUT AVENUE
FUTURE BUILD CONDITIONS - PM PEAK HOUR
LAST DATA SET NAMES LOADED OR SAVED
VOLUME=FBBSHP      GEOMETRICS=NEMCBSH    SIGNAL=NEMCBSH
LOCATED IN CBD:Y
VOLUME & GEOMETRICS
             VOLUMES        # OF LANES      LANE WIDTH      CROSS
DIR  LT    TH    RT   TOTAL  LT  TH  RT      LT    TH    RT     WALK
EB    0     0     0      0    0   0   0     0.0   0.0   0.0     35
WB    0   875     0    875    0   3   0     0.0  11.0   0.0     34
NB  122     0     0    122    2   0   0    15.0   0.0   0.0     62
SB    0     0   319    319    0   0   2     0.0   0.0  12.0     40

TOTAL VOLUME =   1316

TRAFFIC & ROADWAY CONDITIONS
                  ADJ PARK                 PEDESTRIANS       ARR
DIR GRADE  %HV    Y/N MOVES BUSES   PHF  CROSS BUT MIN TIME TYPE
EB  0.0%  0.0%           0     0   .000    0        11.8     0
WB  0.0%  3.0%     N     0     0   .790    0    Y   11.8     3
NB  0.0%  3.0%     Y     0     0   .850    0    Y   18.5     3
SB  0.0%  1.0%     Y     0     0   .820    0    Y   18.5     3

PHASINGS
    EASTBOUND   WESTBOUND   NORTHBOUND  SOUTHBOUND GREEN  Y+R PRE/ACT
    l  t  r  p  l  t  r  p  l  t  r  p  l  t  r  p
 1                 *                 *           *  43.9    4     A
 2           *           *  *                 *     28.1    4     A

CYCLE= 80.0  LOST= 8.0  SUM V/S CRIT= 0.43 TOTAL V/C= 0.48

LEVEL OF SERVICE WORKSHEET
DIR LN GROUP  v/c CM g/C     C      d1     c      d2   PF     Delay LOS Avg Q  95%

WB  TH        0.48 * 0.55  80.0   8.42 2537    0.00 0.85    7.16   B   11.1
NB  LT        0.13   0.35  80.0  13.40 1137    0.00 1.00   13.40   B    2.1
SB  RT        0.48 * 0.35  80.0  15.37  851    0.00 0.85   13.06   B    5.6

DIR Delay LOS
WB   7.16  B
NB  13.40  B
SB  13.06  B
INTERSECTION DELAY =  9.05 INTERSECTION LOS=B
```

```
ARD/STEIN-HUDSON ASSOCIATES    USING CINCH (VER 2.0) BY SASAKI ASSOCIATES, IN
                                     03-06-1992 10:25:47
JECT NAME: NEMC 1-C BUILDINGS DEIR  PROJECT NUMBER: 91-086  BY: jh

985  HCM  —  CHAPTER  9:  SIGNALIZED
ERKELEY STREET/ WASHINGTON STREET
URE BUILD CONDITIONS - AM PEAK HOUR
T DATA SET NAMES LOADED OR SAVED
UME=FBBWAA      GEOMETRICS=NEMCBWA     SIGNAL=NEMCBWA
ATED IN CBD:Y
LUME  &  GEOMETRICS
           VOLUMES          # OF LANES       LANE WIDTH        CROSS
 LT    TH    RT   TOTAL   LT  TH  RT       LT    TH    RT      WALK
  0     0     0      0     0   0   0      0.0   0.0   0.0        0
 73  1252   113   1438     0   3   0      0.0  11.0   0.0       34
 85   347     0    432     0   2   0      0.0  11.0   0.0       38
  0     0     0      0     0   0   0      0.0   0.0   0.0        0

AL VOLUME =  1870

RAFFIC  &  ROADWAY  CONDITIONS
               ADJ PARK                   PEDESTRIANS         ARR
 GRADE  %HV    Y/N MOVES BUSES   PHF CROSS BUT MIN TIME  TYPE
 0.0%  0.0%     N     0     0   .000    0    Y    11.5      0
 0.0%  5.0%     Y     0     0   .890    0    Y    11.5      3
 0.0%  8.0%     Y     0     0   .930    0    Y    12.5      3
 0.0%  0.0%     Y     0     0   .000    0    Y    12.5      0

ASINGS
 EASTBOUND    WESTBOUND    NORTHBOUND   SOUTHBOUND GREEN   Y+R PRE/ACT
 l  t  r  p   l  t  r  p   l  t  r  p   l  t  r  p
              *  *  *               *              *  50.6    4    A
          *              *  *  *                      21.4    4    A
.
LE= 80.0   LOST= 8.0   SUM V/S CRIT= 0.56 TOTAL V/C= 0.62

VEL  OF  SERVICE  WORKSHEET
 LN GROUP  v/c CM g/C     C     d1    c      d2    PF    Delay LOS Avg Q  95% Q

 LT-TH-RT 0.62 * 0.63  80.0   6.78 2845    0.32 0.85    6.03  B   13.2
 LT-TH    0.62 * 0.27  80.0  19.60  781    1.17 0.85   17.65  C    7.6

 Delay LOS
  6.03  B
 17.65  C
ERSECTION DELAY =  8.54 INTERSECTION LOS=B
```

```
HOWARD/STEIN-HUDSON ASSOCIATES    USING CINCH (VER 2.0) BY SASAKI ASSOCIATES,
C.                                   03-06-1992 10:29:37
PROJECT NAME: NEMC 1-C BUILDINGS DEIR  PROJECT NUMBER: 91-086   BY: jh

1985 HCM - CHAPTER 9: SIGNALIZED
E.BERKELEY STREET/ WASHINGTON STREET
FUTURE BUILD CONDITIONS - PM PEAK HOUR
LAST DATA SET NAMES LOADED OR SAVED
VOLUME=FBBWAP      GEOMETRICS=NEMCBWA    SIGNAL=NEMCBWA
LOCATED IN CBD:Y
VOLUME & GEOMETRICS
             VOLUMES         # OF LANES      LANE WIDTH      CROSS
DIR   LT    TH    RT  TOTAL  LT  TH  RT       LT    TH    RT    WALK
EB     0     0     0      0   0   0   0      0.0   0.0   0.0     0
WB   122   772    95    989   0   3   0      0.0  11.0   0.0    34
NB    82   348     0    430   0   2   0      0.0  11.0   0.0    38
SB     0     0     0      0   0   0   0      0.0   0.0   0.0     0

TOTAL VOLUME =  1419

TRAFFIC & ROADWAY CONDITIONS
                  ADJ PARK                PEDESTRIANS        ARR
DIR GRADE  %HV    Y/N MOVES BUSES   PHF  CROSS BUT MIN TIME TYPE
EB  0.0%   0.0%    N     0     0   .000     0   Y     11.5     0
WB  0.0%   3.0%    Y     0     0   .950     0   Y     11.5     3
NB  0.0%   2.0%    Y     0     0   .810     0   Y     12.5     3
SB  0.0%   0.0%    Y     0     0   .000     0   Y     12.5     0

PHASINGS
    EASTBOUND   WESTBOUND   NORTHBOUND  SOUTHBOUND GREEN  Y+R PRE/ACT
    l  t  r  p  l  t  r  p  l  t  r  p  l  t  r  p
 1              *  *  *              *           *  41.8    4    A
 2           *           *  *  *                    30.2    4    A

CYCLE= 80.0  LOST= 8.0  SUM V/S CRIT= 0.44 TOTAL V/C= 0.49

LEVEL OF SERVICE WORKSHEET
DIR LN GROUP  v/c CM g/C     C      d1    c      d2    PF    Delay LOS Avg Q  95%

WB  LT-TH-RT 0.49 * 0.52  80.0   9.33 2338   0.00 0.85    7.93  B  11.1
NB  LT-TH    0.49 * 0.38  80.0  14.44 1138   0.00 0.85   12.27  B   7.3

DIR Delay LOS
WB   7.93  B
NB  12.27  B
INTERSECTION DELAY =  9.35 INTERSECTION LOS=B
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WARD/STEIN-HUDSON ASSOCIATES    USING CINCH (VER 2.0) BY SASAKI ASSOCIATES, IN
:                                          03-06-1992 10:32:45
OJECT NAME: NEMC 1-C BUILDINGS DEIR  PROJECT NUMBER: 91-086  BY: jh

1985 HCM  -  CHAPTER 9:  SIGNALIZED
BERKELEY STREET/ HARRISON AVENUE
TURE BUILD CONDITIONS - AM PEAK HOUR
ST DATA SET NAMES LOADED OR SAVED
LUME=FBBHRA      GEOMETRICS=NEMCBHR     SIGNAL=NEMCBHR
CATED IN CBD:Y
OLUME  &  GEOMETRICS
          VOLUMES          # OF LANES        LANE WIDTH       CROSS
R  LT    TH    RT  TOTAL   LT  TH  RT       LT    TH    RT     WALK
    0     0     0     0     0   0   0      0.0   0.0   0.0     35
  119  1213   481  1813     0   3   0      0.0  12.0   0.0     46
   71   322     0   393     0   1   0      0.0  15.0   0.0     50
    0   286    81   367     0   2   0      0.0  13.0   0.0     35

TAL VOLUME =  2573

RAFFIC  &  ROADWAY  CONDITIONS
              ADJ PARK                     PEDESTRIANS          ARR
R GRADE  %HV   Y/N MOVES BUSES   PHF  CROSS  BUT  MIN TIME  TYPE
  0.0%   0.0%         0      0   .000    0            14.5     0
  0.0%   5.0%   Y     0      0   .900    0     Y      14.5     3
  0.0%   5.0%   Y     0      0   .900    0     Y      15.5     3
  0.0%   5.0%   Y     0      0   .900    0     Y      15.5     3

HASINGS
  EASTBOUND    WESTBOUND    NORTHBOUND   SOUTHBOUND GREEN   Y+R PRE/ACT
  l  t  r  p   l  t  r  p   l  t  r  p   l  t  r  p
               *  *  *               *              *   46.8   4    A
.          *           *  *  *               *  *       25.2   4    A

CLE= 80.0  LOST= 8.0  SUM V/S CRIT= 0.77 TOTAL V/C= 0.85

EVEL  OF  SERVICE  WORKSHEET
R LN GROUP  v/c CM g/C      C     d1     c       d2   PF    Delay LOS Avg Q  95% Q

  LT-TH-RT 0.84 * 0.59   80.0  10.28 2639    2.14 0.85   10.55  B   18.6
  LT-TH    0.88 * 0.31   80.0  19.78  494   13.72 0.85   28.48  D    7.8
  TH-RT    0.43   0.31   80.0  16.52  993    0.00 0.85   14.04  B    6.2

R Delay LOS
  10.55  B
  28.48  D
  14.04  B
TERSECTION DELAY = 13.58 INTERSECTION LOS=B
```

```
HOWARD/STEIN-HUDSON ASSOCIATES    USING CINCH (VER 2.0) BY SASAKI ASSOCIATES,
C.                                   03-06-1992 10:46:04
PROJECT NAME: NEMC 1-C BUILDINGS DEIR  PROJECT NUMBER: 91-086  BY: jh

1985 HCM - CHAPTER 9: SIGNALIZED
E.BERKELEY STREET/ HARRISON AVENUE
FUTURE BUILD CONDITIONS - PM PEAK HOUR
LAST DATA SET NAMES LOADED OR SAVED
VOLUME=FBBHRP     GEOMETRICS=NEMCBHR    SIGNAL=NEMCBHR
LOCATED IN CBD:Y
VOLUME & GEOMETRICS
             VOLUMES      # OF LANES     LANE WIDTH     CROSS
DIR  LT   TH   RT  TOTAL  LT TH RT      LT   TH   RT    WALK
EB    0    0    0     0    0  0  0     0.0  0.0  0.0    35
WB   57  654  219   930    0  3  0     0.0 12.0  0.0    46
NB   69  378    0   447    0  1  0     0.0 15.0  0.0    50
SB    0  366  140   506    0  2  0     0.0 13.0  0.0    35

TOTAL VOLUME =  1883

TRAFFIC & ROADWAY CONDITIONS
                 ADJ PARK             PEDESTRIANS        ARR
DIR GRADE %HV   Y/N MOVES BUSES  PHF CROSS BUT MIN TIME TYPE
EB  0.0%  0.0%         0    0   .000    0        14.5    0
WB  0.0%  2.0%   Y     0    0   .900    0   Y    14.5    3
NB  0.0%  2.0%   Y     0    0   .900    0   Y    15.5    3
SB  0.0%  2.0%   Y     0    0   .900    0   Y    15.5    3

PHASINGS
    EASTBOUND   WESTBOUND   NORTHBOUND  SOUTHBOUND GREEN  Y+R PRE/ACT
    l  t  r  p  l  t  r  p  l  t  r  p  l  t  r  p
 1              *  *  *              *           *  31.8   4    A
 2           *           *  *  *           *  *     40.2   4    A

CYCLE= 80.0  LOST= 8.0  SUM V/S CRIT= 0.57 TOTAL V/C= 0.63

LEVEL OF SERVICE WORKSHEET
DIR LN GROUP  v/c CM g/C     C     d1     c      d2   PF    Delay LOS Avg Q  95%

WB  LT-TH-RT 0.62 * 0.40  80.0  14.64 1830   0.48 0.85   12.85  B  13.8
NB  LT-TH    0.64 * 0.50  80.0  11.10  777   1.36 0.85   10.59  B   5.5
SB  TH-RT    0.37   0.50  80.0   9.26 1595   0.00 0.85    7.87  B   6.2

DIR Delay LOS
WB  12.85  B
NB  10.59  B
SB   7.87  B
INTERSECTION DELAY = 11.02 INTERSECTION LOS=B
```

```
                                              USING CINCH (VER 2.0) BY SASAKI ASSOCIATES, IN
                                              03-06-1992 11:22:00
ROJECT NAME: NEMC 1-C BUILDINGS DEIR  PROJECT NUMBER: 91-086  BY: jh

.985 HCM — CHAPTER 9: SIGNALIZED
.BERKELEY STREET/ ALBANY STREET
UTURE BUILD CONDITIONS - AM PEAK HOUR
AST DATA SET NAMES LOADED OR SAVED
OLUME=FBBABA      GEOMETRICS=NEMCBAB     SIGNAL=NEMCBAB
OCATED IN CBD:Y
VOLUME & GEOMETRICS
            VOLUMES          # OF LANES       LANE WIDTH       CROSS
IR  LT    TH    RT   TOTAL   LT  TH  RT      LT    TH    RT     WALK
B    0     0     0       0    0   0   0     0.0   0.0   0.0      0
B  432  1716     0    2148    0   3   0     0.0  12.0   0.0     40
B    0     0     0       0    0   0   0     0.0   0.0   0.0      0
B   68  1262   171    1501    0   4   0     0.0  12.0   0.0     56

OTAL VOLUME =  3649

TRAFFIC & ROADWAY CONDITIONS
               ADJ PARK                PEDESTRIANS          ARR
IR GRADE %HV   Y/N MOVES BUSES  PHF  CROSS BUT MIN TIME  TYPE
B  0.0%  0.0%   N     0     0   .000    0   N    17.0     0
B  0.0%  6.0%   N     0     0   .860    0   N    17.0     3
B  0.0%  0.0%   N     0     0   .000    0   N    21.0     0
B  0.0%  8.0%   N     0     0   .940    0   N    21.0     3

PHASINGS
  EASTBOUND    WESTBOUND    NORTHBOUND   SOUTHBOUND GREEN  Y+R PRE/ACT
  l  t  r  p   l  t  r  p   l  t  r  p   l  t  r  p
1              *  *                                  61.6   4    A
2                                        *  *  *     30.4   4    A

YCLE=100.0  LOST= 8.0  SUM V/S CRIT= 0.87 TOTAL V/C= 0.94

LEVEL OF SERVICE WORKSHEET
IR LN GROUP  v/c CM g/C    C     d1    c     d2   PF    Delay LOS Avg Q  95% Q

B  LT-TH    0.94 * 0.62 100.0 13.39 2908   5.86 0.85  16.36  C  28.1
B  LT-TH-RT 0.94 * 0.30 100.0 25.84 1859   8.33 0.85  29.05  D  32.2

IR Delay LOS
B  16.36  C
B  29.05  D
NTERSECTION DELAY = 21.31 INTERSECTION LOS=C
```

```
HOWARD/STEIN-HUDSON ASSOCIATES    USING CINCH (VER 2.0) BY SASAKI ASSOCIATES,
C.                                   03-06-1992 11:24:43
PROJECT NAME: NEMC 1-C BUILDINGS DEIR  PROJECT NUMBER: 91-086  BY: jh

1985 HCM - CHAPTER 9: SIGNALIZED
E.BERKELEY STREET/ ALBANY STREET
FUTURE BUILD CONDITIONS - PM PEAK HOUR
LAST DATA SET NAMES LOADED OR SAVED
VOLUME=FBBABP       GEOMETRICS=NEMCBAB     SIGNAL=NEMCBAB
LOCATED IN CBD:Y
VOLUME & GEOMETRICS
               VOLUMES          # OF LANES      LANE WIDTH      CROSS
DIR  LT    TH    RT   TOTAL   LT TH RT       LT    TH    RT     WALK
EB    0     0     0      0     0  0  0      0.0   0.0   0.0      0
WB  497   754     0   1251     0  3  0      0.0  12.0   0.0     40
NB    0     0     0      0     0  0  0      0.0   0.0   0.0      0
SB   62  2340   214   2616     0  4  0      0.0  12.0   0.0     56

TOTAL VOLUME =  3867

TRAFFIC & ROADWAY CONDITIONS
                  ADJ PARK                PEDESTRIANS        ARR
DIR GRADE  %HV    Y/N MOVES BUSES  PHF CROSS BUT MIN TIME TYPE
EB  0.0%  0.0%     N      0     0  .000   0    N     17.0    0
WB  0.0%  2.0%     N      0     0  .850   0    N     17.0    3
NB  0.0%  0.0%     N      0     0  .000   0    N     21.0    0
SB  0.0%  2.0%     N      0     0  .910   0    N     21.0    3

PHASINGS
    EASTBOUND    WESTBOUND    NORTHBOUND   SOUTHBOUND GREEN   Y+R PRE/ACT
    l  t  r  p   l  t  r  p   l  t  r  p   l  t  r  p
 1               *  *                                  37.0    4     A
 2                                         *  *  *     55.0    4     A

CYCLE=100.0  LOST= 8.0  SUM V/S CRIT= 0.84 TOTAL V/C= 0.91

LEVEL OF SERVICE WORKSHEET
DIR LN GROUP   v/c CM g/C     C      d1     c       d2   PF    Delay LOS Avg Q  95%

WB  LT-TH      0.91 * 0.37 100.0  22.69 1783     5.83 0.85   24.24   C   25.8
SB  LT-TH-RT 0.91 * 0.55 100.0  15.39 3482     3.21 0.85   15.81   C   36.0

DIR Delay LOS
WB  24.24  C
SB  15.81  C
INTERSECTION DELAY = 18.66 INTERSECTION LOS=C
```

```
ARD/STEIN-HUDSON ASSOCIATES   USING CINCH (VER 2.0) BY SASAKI ASSOCIATES, IN
                              03-06-1992 11:55:36
JECT NAME: NEMC 1-C BUILDINGS DEIR  PROJECT NUMBER: 91-086  BY: jh

785 HCM  -  CHAPTER 9:  SIGNALIZED
ERKELEY STREET/ FRONTAGE ROAD & FOUTH STREET BRIDGE
URE BUILD CONDITIONS - AM PEAK HOUR
T DATA SET NAMES LOADED OR SAVED
UME=FBBFFA      GEOMETRICS=NEMCBFF     SIGNAL=NEMCBFF
ATED IN CBD:[
OLUME & GEOMETRICS
          VOLUMES          # OF LANES      LANE WIDTH      CROSS
  LT    TH    RT  TOTAL   LT  TH  RT      LT    TH    RT     WALK
   0     0     0      0    0   0   0     0.0   0.0   0.0      0
   0   666   144    810    0   2   0     0.0  11.0   0.0     22
1612  2184     0   3796    1   2   0    12.0  12.0   0.0     41
   0     0     0      0    0   0   0     0.0   0.0   0.0      0

AL VOLUME =   4606

RAFFIC & ROADWAY CONDITIONS
              ADJ PARK                     PEDESTRIANS          ARR
 GRADE  %HV   Y/N MOVES BUSES  PHF  CROSS BUT MIN TIME  TYPE
 0.0%  0.0%    N     0     0   .000    0           12.5      0
 0.0%  7.0%    N     0     0   .910    0     N     12.5      3
 0.0%  8.0%    N     0     0   .960    0     N     17.3      3
 0.0%  0.0%    N     0     0   .000    0     N     17.3      0

HASINGS
 EASTBOUND   WESTBOUND   NORTHBOUND  SOUTHBOUND GREEN  Y+R PRE/ACT
 l  t  r  p  I  t  r  p  l  t  r  p  l  t  r  p
                *  *                              20.8   3    A
                         *  *                     74.2   2    A

LE=100.0  LOST= 5.0  SUM V/S CRIT= 1.31 TOTAL V/C= 1.38

EVEL OF SERVICE WORKSHEET
 LN GROUP  v/c CM g/C     C     d1    c     d2   PF    Delay LOS Avg Q  95% Q

 TH-RT     1.38 * 0.21 100.0  33.40  679 138.85 0.85  146.41  F  56.9
 LT        1.38 * 0.74 100.0   9.79 1221 135.05 1.00  144.84  F  93.8
 TH        0.93   0.74 100.0   8.14 2570   5.38 0.85   11.49  B  17.6

 Delay LOS
146.41  F
 66.53  F
ERSECTION DELAY = 81.46 INTERSECTION LOS=F
```

```
HOWARD/STEIN-HUDSON ASSOCIATES    USING CINCH (VER 2.0) BY SASAKI ASSOCIATES,
C.                                        03-06-1992 11:57:51
PROJECT NAME: NEMC 1-C BUILDINGS DEIR  PROJECT NUMBER: 91-086  BY: jh

1985 HCM - CHAPTER 9: SIGNALIZED
E.BERKELEY STREET/ FRONTAGE ROAD & FOUTH STREET BRIDGE
FUTURE BUILD CONDITIONS - PM PEAK HOUR
LAST DATA SET NAMES LOADED OR SAVED
VOLUME=FBBFFP      GEOMETRICS=NEMCBFF     SIGNAL=NEMCBFF
LOCATED IN CBD:[
VOLUME & GEOMETRICS
              VOLUMES          # OF LANES      LANE WIDTH       CROSS
DIR   LT    TH     RT   TOTAL   LT  TH  RT      LT    TH    RT    WALK
EB     0     0      0      0    0   0   0      0.0   0.0   0.0     0
WB     0   537     68    605    0   2   0      0.0  11.0   0.0    22
NB   629  2004      0   2633    1   2   0     12.0  12.0   0.0    41
SB     0     0      0      0    0   0   0      0.0   0.0   0.0     0

TOTAL VOLUME =  3238

TRAFFIC & ROADWAY CONDITIONS
                  ADJ PARK                 PEDESTRIANS         ARR
DIR  GRADE  %HV   Y/N MOVES BUSES  PHF  CROSS  BUT MIN TIME  TYPE
EB   0.0%  0.0%    N     0     0   .000    0          12.5     0
WB   0.0%  3.0%    N     0     0   .830    0    N     12.5     3
NB   0.0%  6.0%    N     0     0   .930    0    N     17.3     3
SB   0.0%  0.0%    N     0     0   .000    0    N     17.3     0

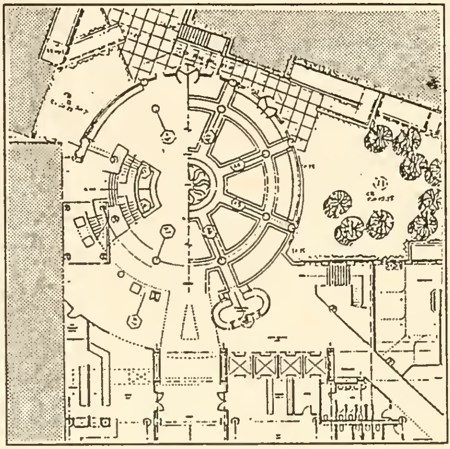
PHASINGS
    EASTBOUND    WESTBOUND    NORTHBOUND   SOUTHBOUND  GREEN  Y+R PRE/ACT
    l  t  r  p   l  t  r  p   l  t  r  p   l  t  r  p
 1                  *  *                                24.7   3    A
 2.                              *  *                   70.3   2    A

CYCLE=100.0  LOST= 5.0  SUM V/S CRIT= 0.87 TOTAL V/C= 0.92

LEVEL OF SERVICE WORKSHEET
DIR LN GROUP   v/c CM g/C     C      d1     c       d2    PF    Delay LOS Avg Q  95%

WB  TH-RT     0.92 * 0.25 100.0  27.90   832   12.19 0.85   34.08  D   16.6
NB  LT        0.58   0.70 100.0   5.64  1168    0.45 1.00    6.09  B    5.6
NB  TH        0.92 * 0.70 100.0   9.49  2458    5.03 0.85   12.34  B   18.5

DIR Delay LOS
WB  34.08  D
NB  10.90  B
INTERSECTION DELAY = 15.69 INTERSECTION LOS=C
```



Appendix D: Wind

A QUALITATIVE ASSESSMENT OF PEDESTRIAN LEVEL WINDS FOR THE NORTH AND SOUTH BUILDINGS OF THE NEW ENGLAND MEDICAL CENTER HOSPITALS INC. PHASE1 1-C PROJECT

BY

FRANK H. DURGIN

MARCH 31, 1992

SUBMITTED TO:
CARR, LYNCH, HACK, AND .SANDELL
1385 CAMCRIDGE STREET
CAMBRIDGE, MASSACHUSETTS 01239
ATTENTION MARY JANE DALEY

A QUALITATIVE ASSESSMENT OF PEDESTRIAN LEVEL WINDS FOR THE NORTH AND SOUTH BUILDINGS OF THE NEW ENGLAND MEDICAL CENTER HOSPITALS INC. PHASE 1 1-C PROJECT

BY FRANK H. DURGIN

1.0 SUMMARY

An assessment has been made to determine the effect the proposed NEMCH Project 1-C Phase 1 Atrium and North and South Buildings on pedestrian level winds (PLWS) in and near the site of the proposed buildings. Currently there is no place in the site or its immediate surrounding area that has excessive PLWs (i.e. PLWs in Melbourne's Categories 1 or 2) or exceeds the the BRA guideline return period effective gust wind speed of 31 mph once in 100 hours.

The effect of adding the new buildings is to reduce the PLWs away from the site, but to create some windiness near the south corners of the South Building. No areas near the new buildings are expected to have PLWs in Melbourne's Categories 1 or 2 or to exceed the BRA guideline wind speed. Further all entrances, new, old, or moved will have PLWs no worse than Category 4 as an average.

2.0 INTRODUCTION

This assessment of pedestrian level winds (PLWs) in the vicinity of the .proposed North and South Buildings of the New England Medical Center (NEMC) Hospitals Inc. C-1 Project 1-C Phase 1 considers PLWs for existing conditions and the potential effects of the project on those PLWs. The assessment is based on:

1)) The maps and drawings listed below and obtained from Carr, Lynch, Hack, and Sandell (CLHS), The Boston Redevelopment Authority (BRA), Shepley, Bulfinch, Richardson, and Abbott (SBRA), and Elkus/ Manfredi Architects. Ltd. (EMA) :

a) Topographic and Planimetric Survey maps of the area (BRA);

b) A map of the site .and surrounding area giving building heights (CLHS);

c) Various drawings showing ground floor and penthouse plans and elevations of the 1-C Project buildings (SBRA);

d) A set of 21 drawings giving plans and elevations from the Tremont Street Concourse Study (CLHS and EMA);

2) Four site visits:

a) One during which the wind was blowing from the NW;
b) One during which the wind was blowing from the SE;
c) One during which the wind was blowing from the SW;
d) One in which names of buildings and torn down buildings were noted;

3) 24 photographs taken during site visits b and c;

4) A copy of the Scoping Determination issued by the the BRA;

5) An evaluation of the urban context of the proposed project site;

6) A review of the Boston wind climate; and

7) The author's 22 years of experience dealing with PLWs.

The interaction of the wind with buildings and structures is very complicated and, at times, difficult to predict, especially for urban areas such as this, that include a mixture of lowrise, midrise, and highrise buildings. Thus this evaluation provides a qualitative assessment of PLWs.

2.0 LOCATION AND DESCRIPTION OF THE PROJECT AND SURROUNDING AREA (FIGURES 1 AND 2)

2.1 LOCATION AND DESCRIPTION OF THE PROJECT (FIGURES 1 AND 2)

The project will consist two 8 story 142 foot high buildings; a North and a South Building. The site is located between Washington and Ash Streets. in downtown Boston. The north end of the North Building will connect to both the existing Floating Hospital and Proger Buildings and the south end of the South Building will boarder Oak Street. The North Building will actually extend east across Ash Street and displace two of the existing Boston Dispensary Buildings.

The North and South Buildings will be connected both below and above ground, but there will be an opening between the two buildings at ground level that will allow an extension of Nassau Street to pass between the the North and South Buildings (see Figure 2). There will be three entrances to the North Building. Two will be into the round atrium that will form the juncture between the North, Proger, and Floating Hospital Buildings. One of these two will be setback and off Washington Street from under Floating Hospital. The other will be just south of the corner of Ash and Bennet Streets. The third entrance will be to the south of Floating Hospital and off Washington Street, but not set back.

The South Building will have two major entrances in the middle of the sides of the building along Ash and Washington Streets. The Washington Street entrance will be up about 5 steps and set back from the Street. The Ash Street entrance will not be set back.

Currently (See Figure 1), the entire site between Washington, Oak, and Ash Streets up to Floating Hospital is open and used as a parking lot. However, there are two existing buildings that are part of the Boston Dispensary, on the east side

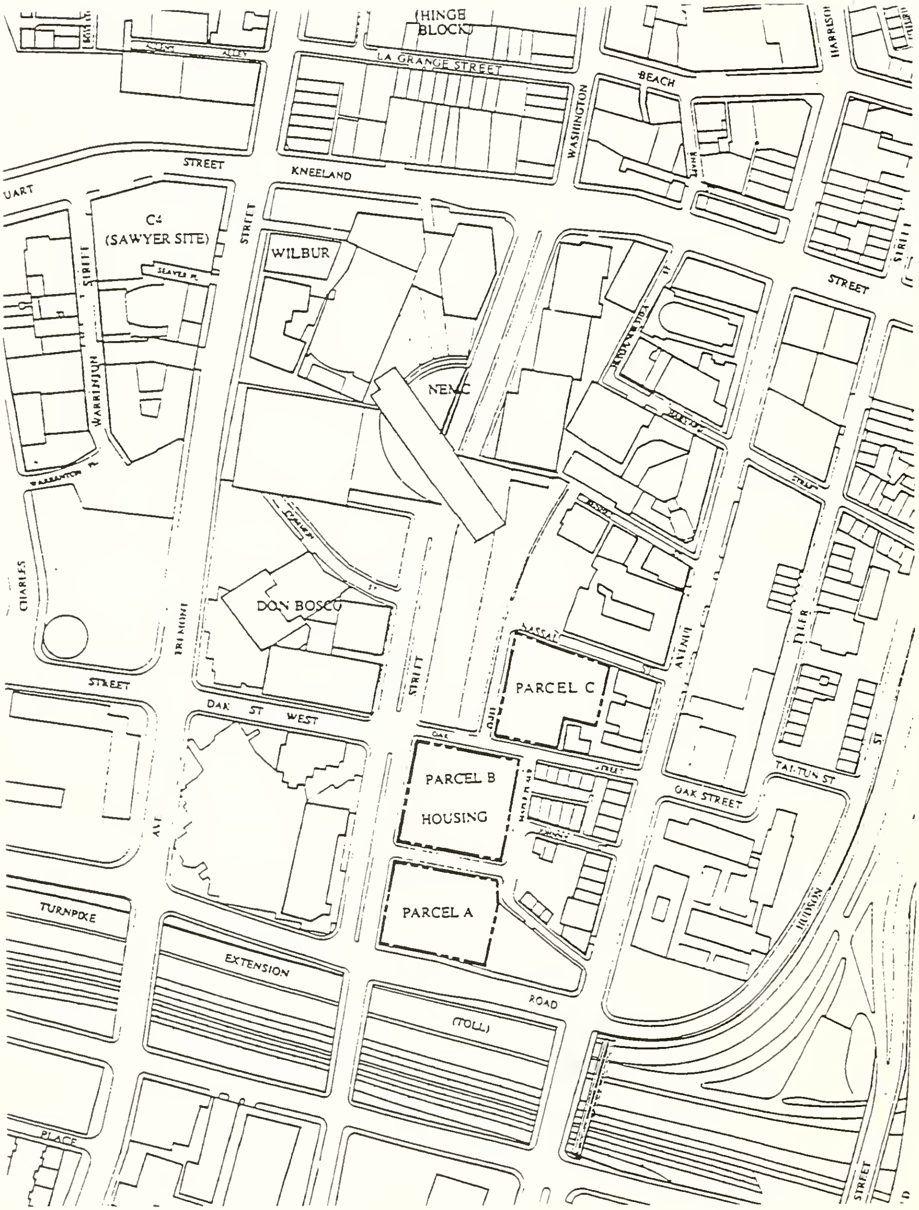
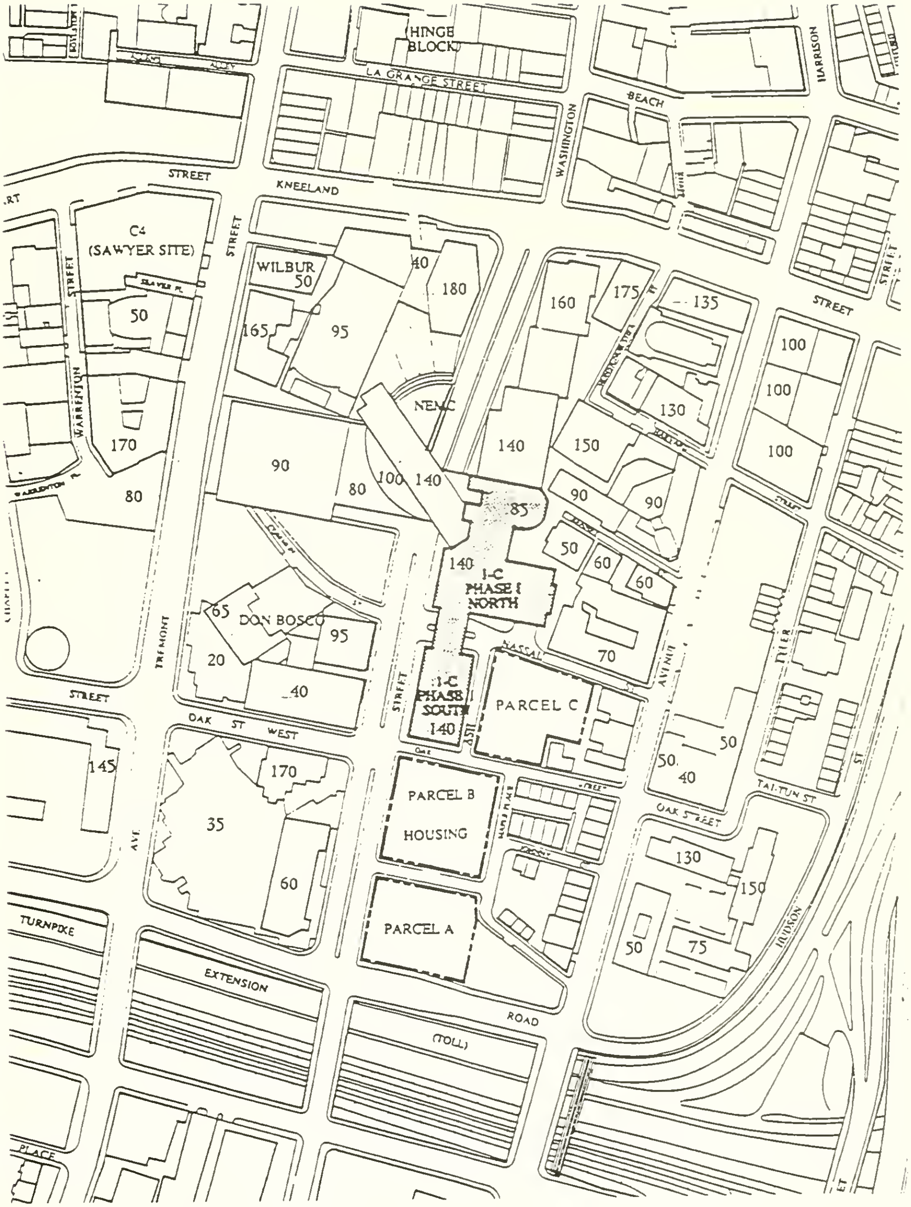


FIGURE 1. Existing Conditions

N.T.S.



note: Elevations in feet above sea level

FIGURE 2. Building Elevations Plan

N.T.S.

of Ash Street that must be torn down to make way for the east end of the North Building.

2.2 THE SURROUNDING AREA (SEE FIGURE 2)

The surrounding area to the NW, N, and NE contains many buildings between 70 and 180 feet tall and thus provides much sheltering for the site for winds from these directions (approximate heights of most buildings are given in Figure 2). To the E there are two 70 foot buildings, the Tufts Clinic and NEMC Rehabilitation Institute Center, but otherwise most buildings are 30 to 50 feet high. To the SE again there are mostly 40 to 50 foot buildings, but across Harrison Avenue one block east of the site is Tai Tung Village, an appartment complex with large 75, and 150 foot buildings. To the S it is open except for one derilict seven story, 70 foot building in parcel B that is scheduled to be demolished and replaced by a 4 story housing project with a 13 story tower. To the SW there is the Don Bosco Technical High School, the 170 foot Quincy appartment building on the south side of Oak Street just down from its intersection with Washington Street and and the 14 story 145 foot Mass Pike Towers across Tremont Street at the corner of Marinal Road. Finally to the W there is the Don Bosco Technical High School with its main building in the center of the block at 90 feet, but there is a large empty gap between it and the 90 foot high 450 car Tremont Street Garage. Thus, except to the S, there are buildings as tall as the proposed buildings which will provide considerable sheltering from winds from all other directions. With the completion of the 13 story parcel B housing project there will be some sheltering to the south.

3.0 THE WIND CLIMATE

3.1 THE VARIATION OF WIND SPEED WITH HEIGHT

In general, the natural wind is unsteady (*i.e.* it is gusty) and its average speed increases with height above the ground. Figure 3 depicts how the average wind speed varies with height for different types of terrain. While generally it does not happen, when one puts up any building, the possibility exists, that the building will bring the higher speed winds at the top of the building down to ground level.

Monolithic buildings (*i.e.* those that do not change shape with height), if they are significantly taller than most of the surrounding buildings, almost invariably will be windy at there base. However, when there are many buildings of similar height in the area, they tend to shelter one another.

The NEMC 1-C Project site will be surrounded by buildings of similar height as the proposed 1-C Phase 1 North and South Buildings. Thus, the site is not windy now, nor will it be windy when the proposed buildings are in place (see Section 5 for details).

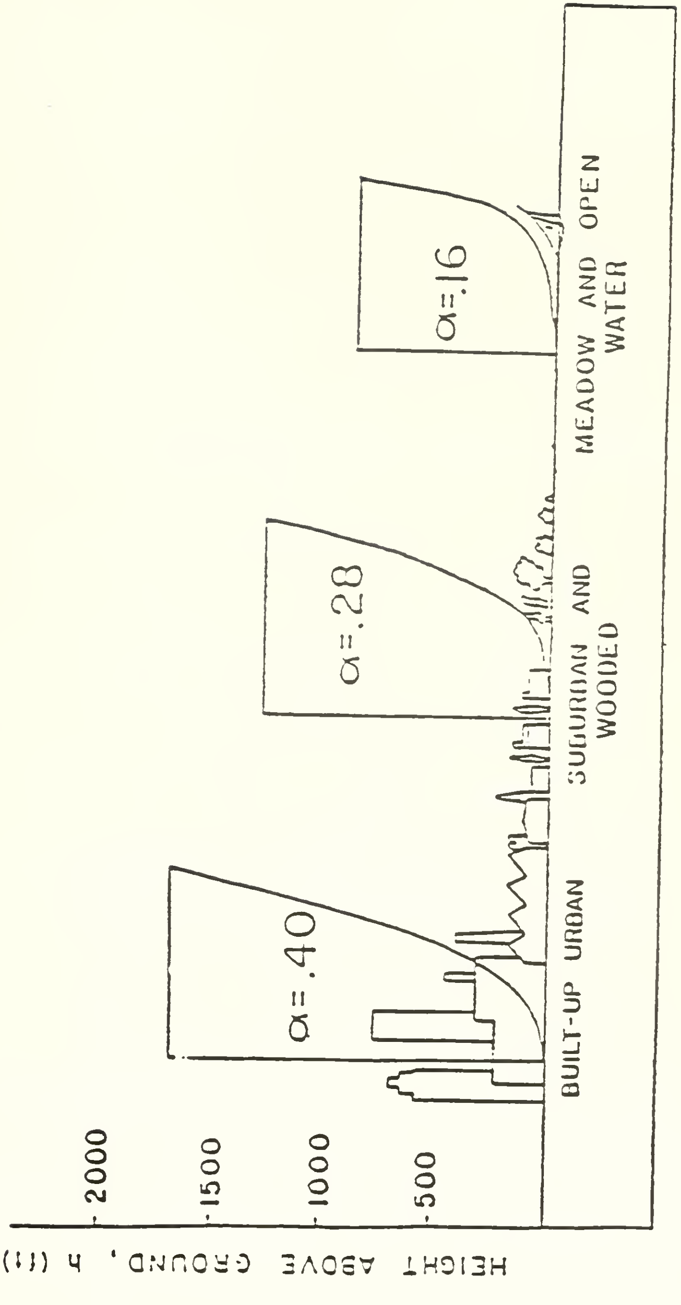


Figure 3 Types of Earth's Boundary Layer after Davenport

FIGURE 3. Types of Earth's Boundary Layer after Davenport N.T.S.

3.2 STATISTICAL DESCRIPTION OF THE BOSTON WIND CLIMATE

The project site is located about three miles WSW of Logan Airfield. Thus, the wind data from Logan Airfield, that is usually used to define the winds for Boston, is applicable. Figure 4 depicts a wind rose for Boston. As noted in the figure, the wind rose is based on surface wind data from Logan Airfield taken from 1945 to 1965. While data from 1965 to 1991 is also available, it is not believed to be as representative of the true winds in Boston, due to the many 25 to 40 story buildings that have been built in financial district of Boston since 1965. The financial district is just one mile west of Logan Airfield. The length of each line radiating from the center of the figure to the outermost crossing line is proportional to the total time the wind comes from that direction. The other lines crossing the radial lines indicate the frequency of winds less than 7.5, 12, and 19 mph.

Figure 4 shows that the winds in Boston come primarily from the NW, W, and SW. Figures 5 through 8 show wind roses for Boston for winter (Dec., Jan., and Feb.), spring (Mar., Apr., and May), summer (Jun., Jul., and Aug.), and fall (Sep., Oct., and Nov.). These figures show that NW winds tend to occur during the colder months and SW winds during the warmer months. Spring and fall are transitional, but winds in the spring are stronger than those in the fall. Strong easterly winds usually occur during storms when there is percipitation.

As already noted, the project site is shielded from NW winds by the Wang Preforming Arts Center and the 450 car Tremont Street garage next to it. It is shielded from W and SW winds by the Don Bosco Technical High School and the seventeen story Quincy Appartment Building near the corner of Oak and Washington Street. The site is also shielded from most easterly winds. It will only be open to SSW, S, and SSE winds after the seven story derelict building to the south of the site across Oak Street is demolished and before the Parcel B Housing Project is complete.

The average wind speed at Logan Airfield at 58 feet (the averrage height at which the data was taken) is 12.9 mph. At pedestrian height (*i.e.* at chest height, 4.5 feet) it is about 8 mph. The average wind speed at 58 feet at Logan Airfield for each month is shown in Figure 9. Seasonally the average is 14.2 mph in the winter, 13.9 in the spring, 11.2 in the summer, and 12.3 in the fall. The fastest hourly wind for a one hundred hour return period, however, is slightly faster in the spring than in the winter.

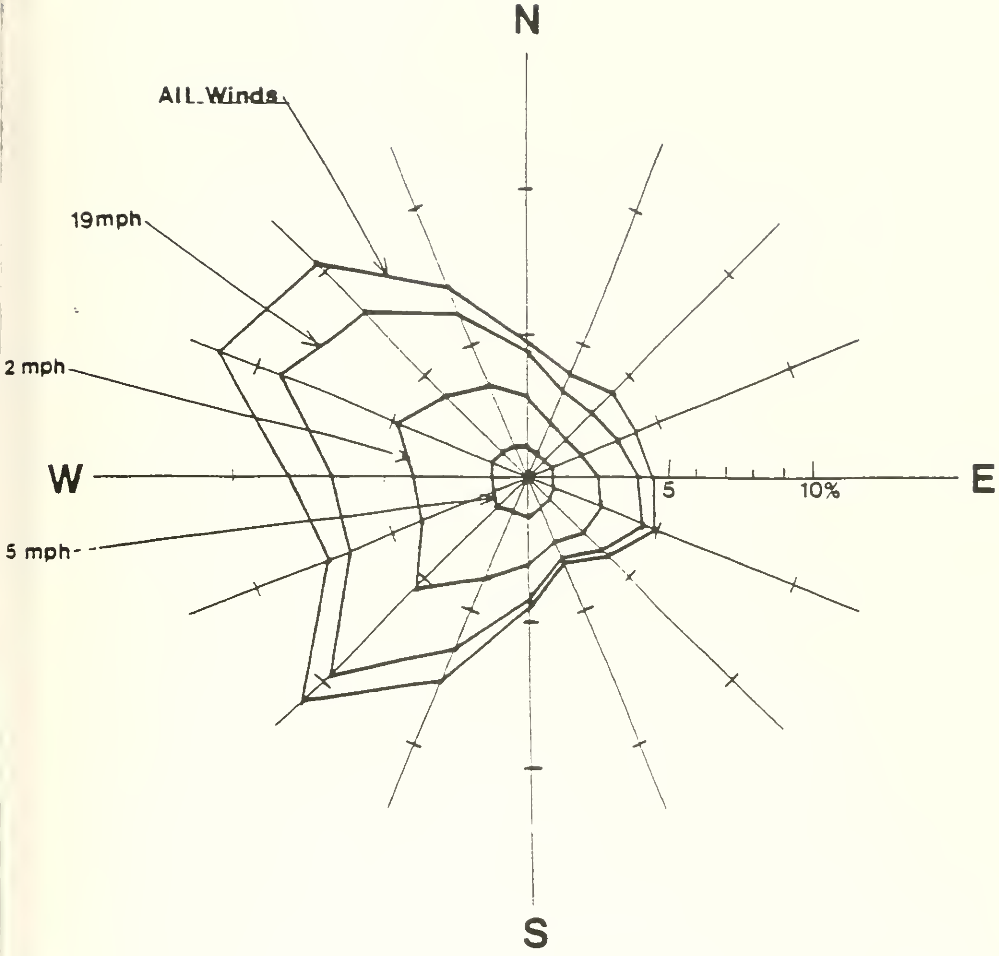


Figure 4 Boston wind rose for the year
Surface data obtained from Logan Airport 1945-1965

FIGURE 4. Boston Wind Rose N.T.S.

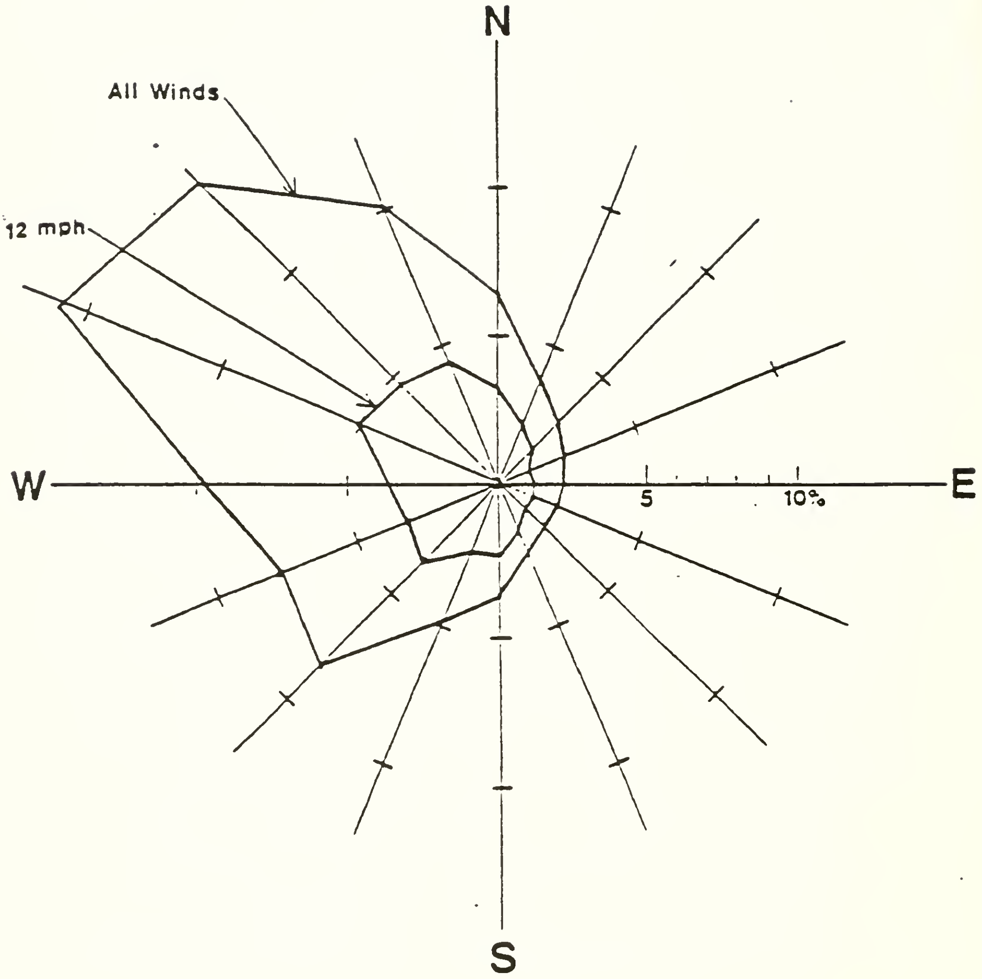


Figure 5. Boston wind rose for the Winter (December, January, February
Surface data obtained from Logan Airport 1945-1965

FIGURE 5. Boston Wind Rose for Winter *N.T.S.*

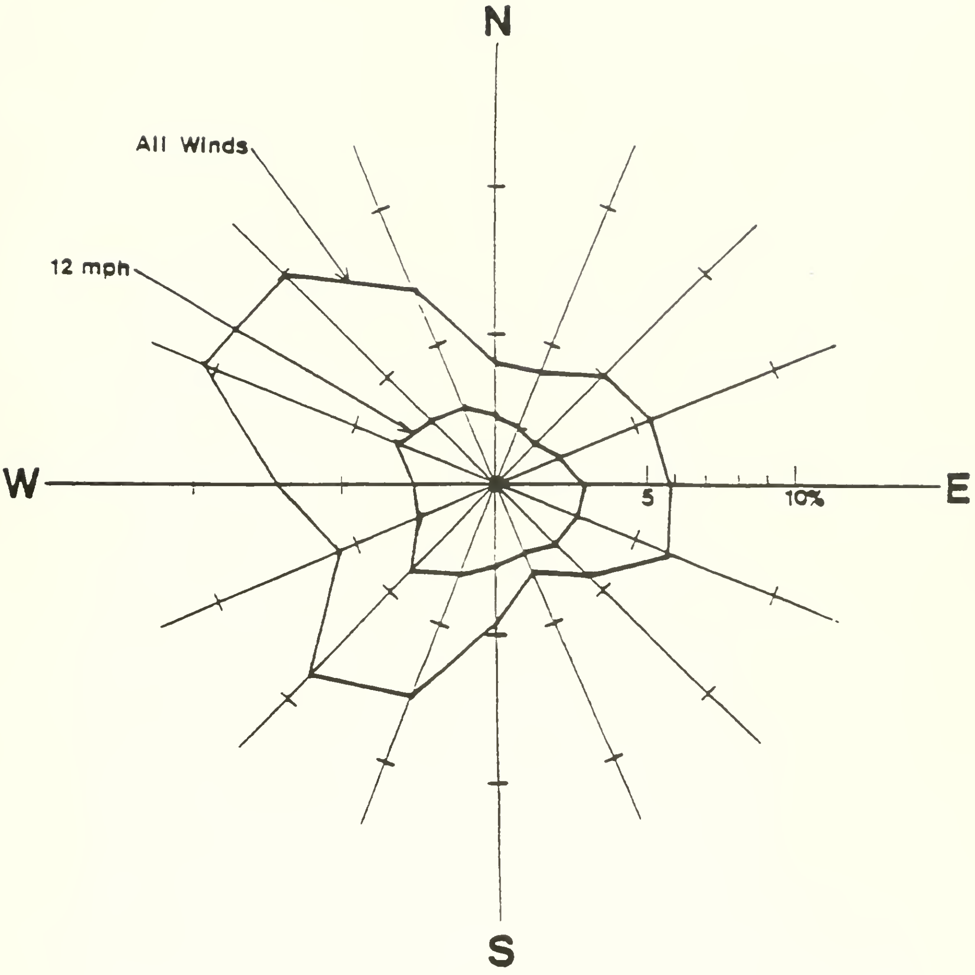


Figure 6 Boston wind rose for the Spring (March, April, May)
Surface data obtained from Logan Airport 1945-1965

FIGURE 6. Boston Wind Rose for Spring N.T.S.

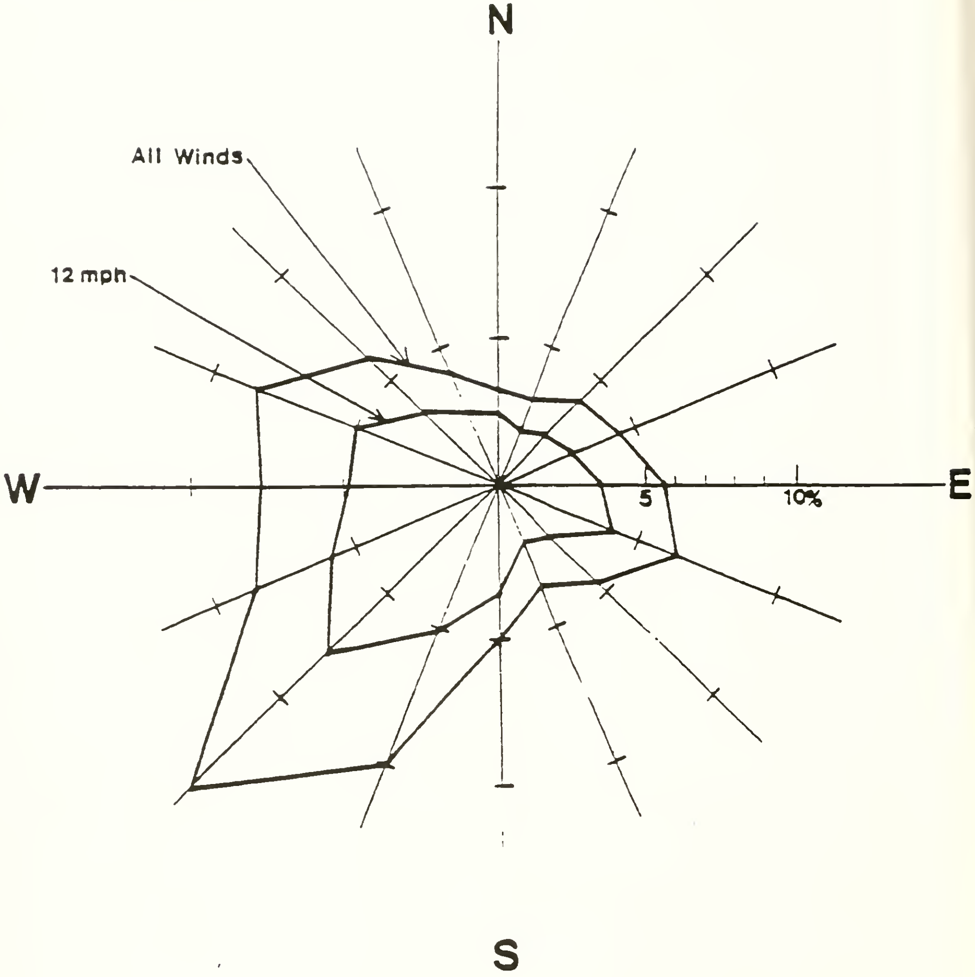


Figure 7 Boston wind rose for the Summer (June, July, August)
Surface data obtained from Logan Airport 1945-1965

FIGURE 7. Boston Wind Rose for Summer N.T.S.

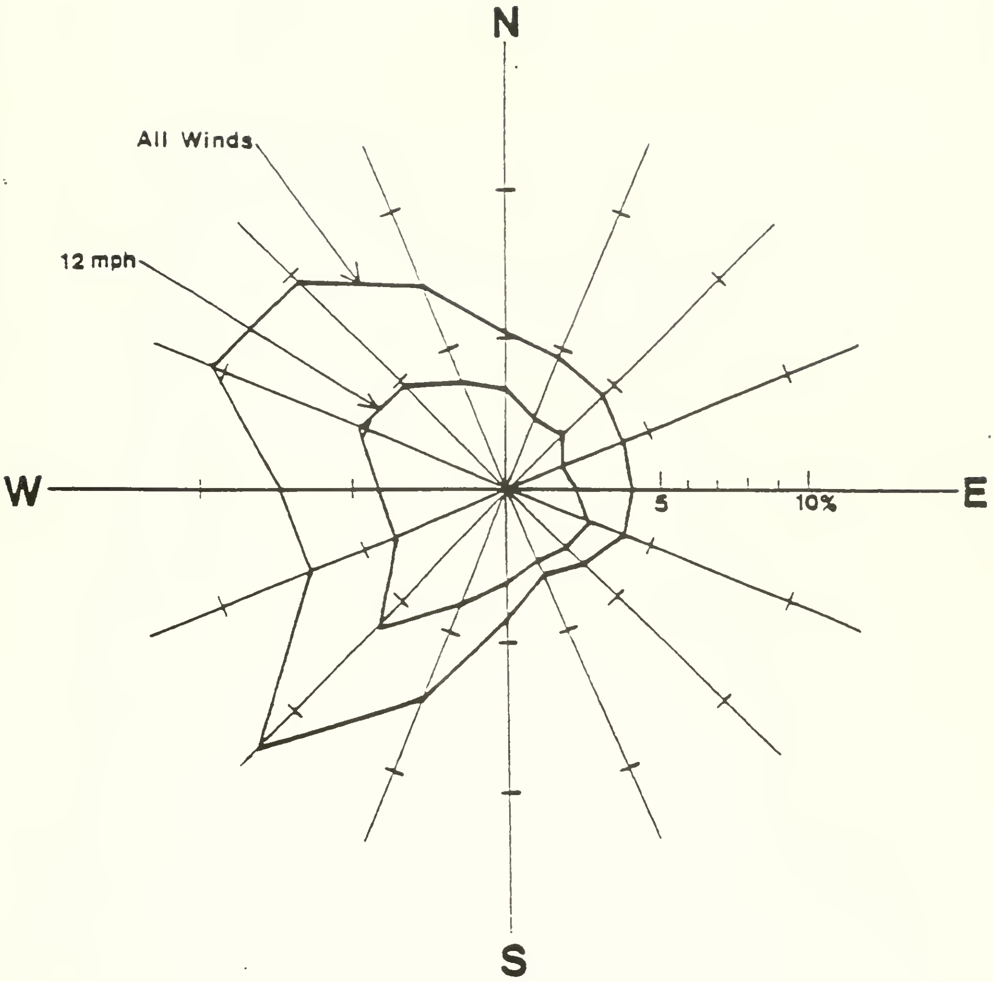
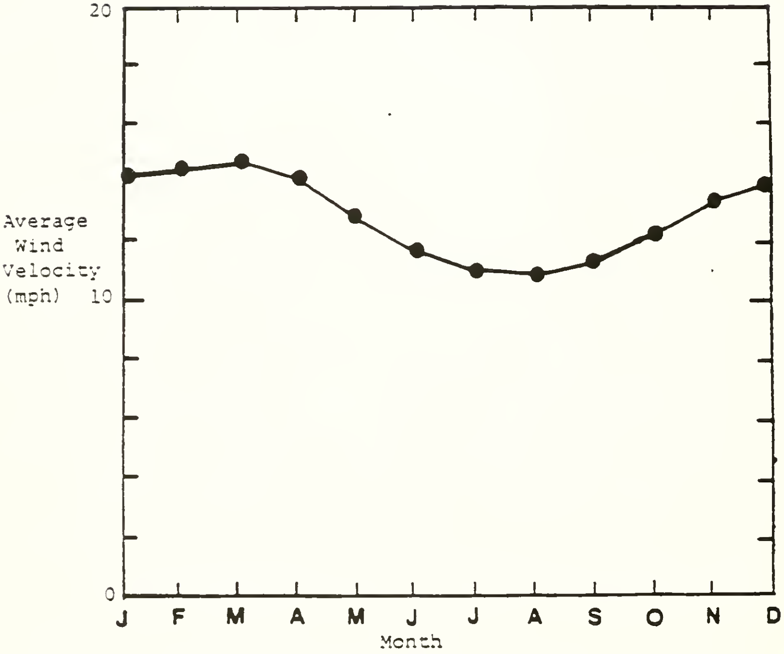


Figure 8 Boston wind rose for the Fall (September, October, November) Surface data obtained from Logan Airport 1945-1965

Fig. 9 . Average Wind Velocity at Logan Airport at 58 ft 1945 - 1965 by month.



Overall average 12. mph

FIGURE 9. Average Wind Velocity *N.T.S.*

4.0 CRITERIA

Since the early 1980s, Boston has used a guildeline criteria for acceptable winds of not exceeding a 31 mph effective gust more often than once in one hundred hours. The effective gust is defined as the average wind speed plus 1.5 times the root mean square variation about the average (rms). When many stations are considered the effective gust averages 1.38 times the average wind speed.

In 1978, Melbourne [2] developed a probablistic criteria for average PLWs which accounted for different types of pedestrian activity as well as the safety aspects of such winds (see Figure 10). He defined five categories of PLWs:

1) Dangerous and Unacceptable;
2) Uncomfortable for Walking;
3) Comfortable for Walking;
4) Comfortable for Short Periods of Standing and Sitting;
5) Comfortable for Long Periods of Standing or Sitting.

These criteria are not absolute (any location can have dangerous winds in a hurricane), rather, they imply that the location would have wind speeds such that the activity suggested is possible most of the time, and would be precieved as such, by most people who frequent the location. For example, the winds at pedestrian level at Logan Airfield are just in Category 2 (see Figure 10), uncomfortable for walking, and are just under the BRA 31 mph effective gust wind speed guideline (converted to an average wind). Therefore, most people would preceive conditions in the open at Logan Airfield as uncomfortable for walking.

5.0 PEDESTRIAN LEVEL WINDS AT THE SITE

5.1 INTRODUCTION

In the following sections the effects of NW winter winds, SW summer winds, and easterly storm winds will be discussed for existing conditions assuming the derielict building to the south across Oak Street has been demolished and for build conditions assuming the North and South 1-C Phase 1 Project Buildings and the Tremont Street Concourse Project are complete. Comments will also be made with regard to the effect of the North and South Buildings on winds in the future open space that will be created in the area now containing Bennet Street. Bennet Street will no longer exist following the completion 1-C Phase 2 Project.

For the most part the weather in New England is dominated by either large coastal storms (fall, winter, and spring) or the Bermuda High (summer).

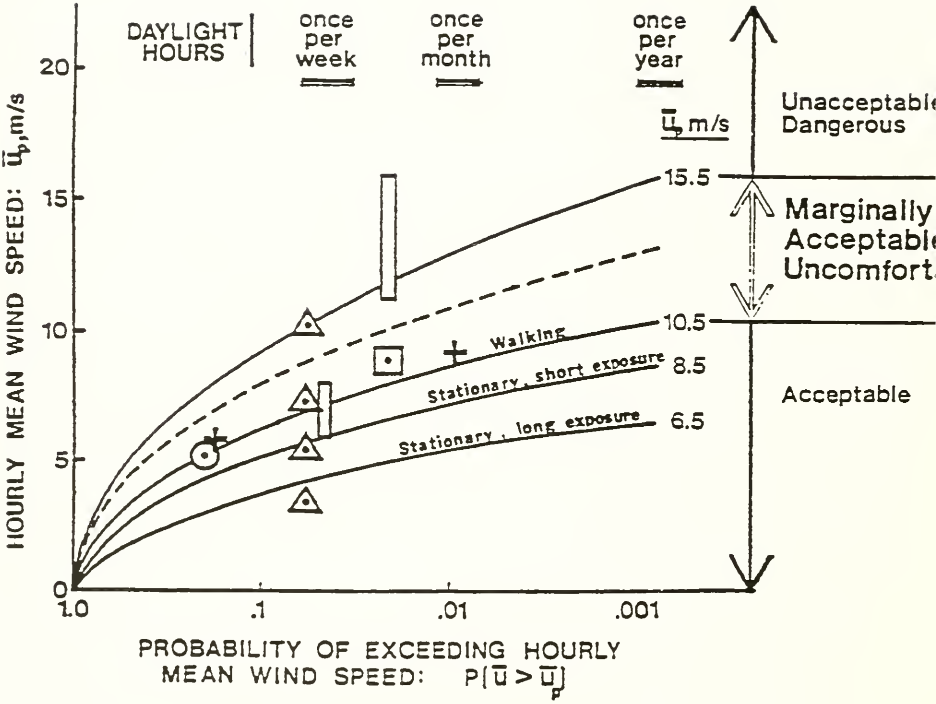


FIGURE 10. International Pedestrian Comfort Criteria *N.T.S.*

Typically, when a coastal storm occurs, it rains or snows for 4 to 12 hours, then it clears, and , as the storm moves to the NE, the winds blow from the NW for three or four days until the next weather system arrives. These storms and the NW winds following them, occur mostly in the fall, winter, and spring. NW winds are particularly uncomfortable in the winter, when typically they occur on cold days. The Bermuda High is generally responsible for the SW winds that occur in the summer.

5.2 NORTHWEST (WINTER) WINDS (FIGURES 11 AND 12)

5.2 1 Introduction

NW winds blow diagonally across the site roughly parallel to the long axis of the Floating Hospital Building and along a line from the intersection of Stuart and Tremont Streets toward the intersection of Oak Street and Harrison Avenue. Such winds, when they are at all strong, can be very uncomfortable on a cold wintery day.

5. 1.2 NW winds for Existing Conditions (Figure 11)

Washington Street north of Floating Hospital up to Kneeland Street is protected from the brunt of NW winds by the Nutrition Center Building, but some wind goes around the north end of Nutrition Center Building, and blows south down Washington Street toward Floating Hospital. This component of the wind is only noticable on the east side of the street in front of the Farr Dental Building (Category 5). The entrances to the Farr and Proger Buildings are calm (Category 5). Some wind also comes through the gap between the Nutrition Building and the Wang Center and combined with the other wind causes the classic vortex and reverse flow in the Washington Street in front of the Proger Building (Category5). However, there is a noticable north wind under the Floating Hospital, especially on the east side of the street (Category 4). The main entrance to Floating Hospital, which is setback and on the west side under the Hospital is not windy (Category 5).

The presence of the Quality Inn across Tremont Street from the entrance to the Concourse between Washington and Tremont Streets prevents any noticable winds in the Concourse (Category 5). Nor is there any windiness at the exit at the Washington Street end. Likewise the presence the Wang Center, the Tremont Street Garage, and Floating Hospital prevent any noticable winds in the open passageway between Washington and Bennet Streets (Category 5). Even the Washington Street entrance to this passageway is calm (Category 5) because of the way it is setback from the street.

To the south along Washington Street from the Floating Hospital Building it is calm (Category 5) on both sides of the street all the way to Hudson Road except at two places. The first is near the corner of the 95 foot building of the Don Bosco School just at the south end of the open area (Category 4 very locally). The second is near the SW corner of the intersection of Washington and Oak

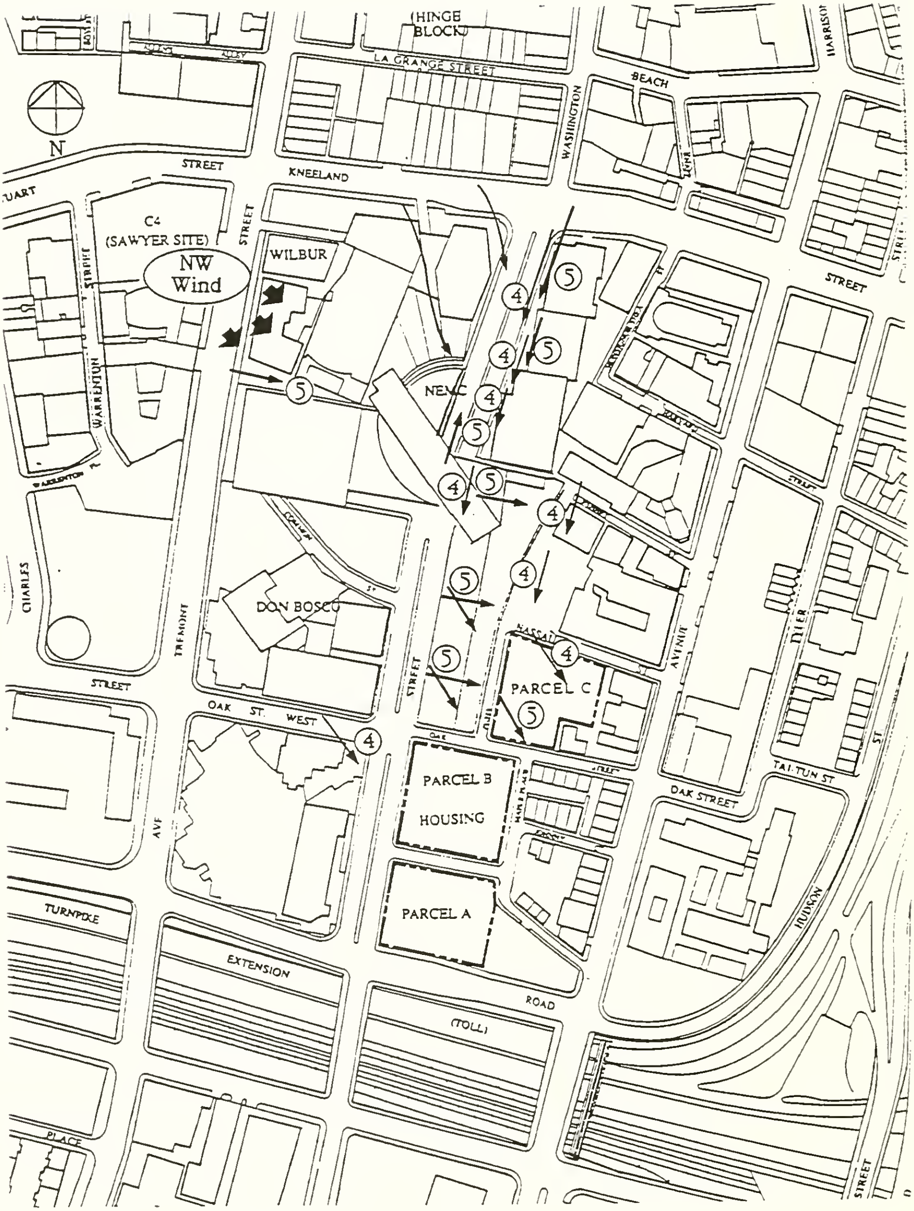


FIGURE 11. WIND STUDIES: Northwesterly Wind, Existing Conditions N.T.S.

Streets (Category 4). The wind here is due to the presence of the 17 story Quincy Appartment Building on Oak Street near that corner.

The sidewalks along side the parking lot on the east side of Ash Street between Oak and Nassau Streets are calm (Category 5), as are the sidewalks on both sides of Ash Street all the way to Bennet Street.

Bennet Street and all the entrances along it are also calm (Category 5).

5.2.2 NW Winds for Build Conditions (Figure 12)

Wind Conditions along the Washington Street sidewalks to the north of Floating Hospital up to Kneeland Street will be unchanged and all winds in Category 5. Nor will the Category 4 winds under Floating Hospital or at its main entrance (Category 5) be effected. If the Tremont Street Concourse is unchanged the winds in it and at both entrances will be unchanged (Category 5). If the planned Concourse is completed it, will be enclosed and the entrances on both Washington and Tremont Streets will have winds in Category 5.

The existing open passageway between Washington and Bennet Street will be closed off, but because the main entrance to the Atrium under Floating Hospital, will be setback from Washington Street, it will experience almost no wind (Category 5). The other entrances to the Atrium off Bennet and Ash Streets will be in the lee of the new buildings and not windy (Category 5).

To the south of Floating Hospital along Washington Street the new buildings will effect the windiness for NW winds. While the Quality Inn, the Wang Center, the Tremont Street Garage, and to some extent the Floating Hospital Buildings will tend to shelter both the North and South Buildings of the 1-C Phase 1 Project from NW winds, both new buildings will be high enough to intercept some of the slowed down wind. Thus, it is to be expected that there will be an increse in the winds on the east side of Washington Street from Floating Hospital to Oak Street. In the area of the third entrance to the North Building on the east side of Washington Street just south of Floating Hospital winds will probably be in low Category 4. From there to Oak Street the winds will be high in Category 4. Because the entrances to the South Building off Washington Street are setback considerably from the sidewalk they will not be windy (Category 5). However, the winds at the SE corner of the North Building at the corner of Washington and Nassau Streets, and at the SE corner of the South Building at the corner of Washington and Oak Streets will be noticable and in Category 3. From Oak Street to Hudson Road the winds on the east side of Washington Street will be unchanged (Category 5).

The winds on the west side of Washington Street will also remain unchanged (Category 5). The windiness near the Don Bosco Building at the end of the open space may be reduced (Category 4) and that off the Quincy Appartment Building on Oak Street increased (possibly to Category 3). South of Oak Street on the west side of Washington Street the winds will be unchanged (Category 5 or 4).

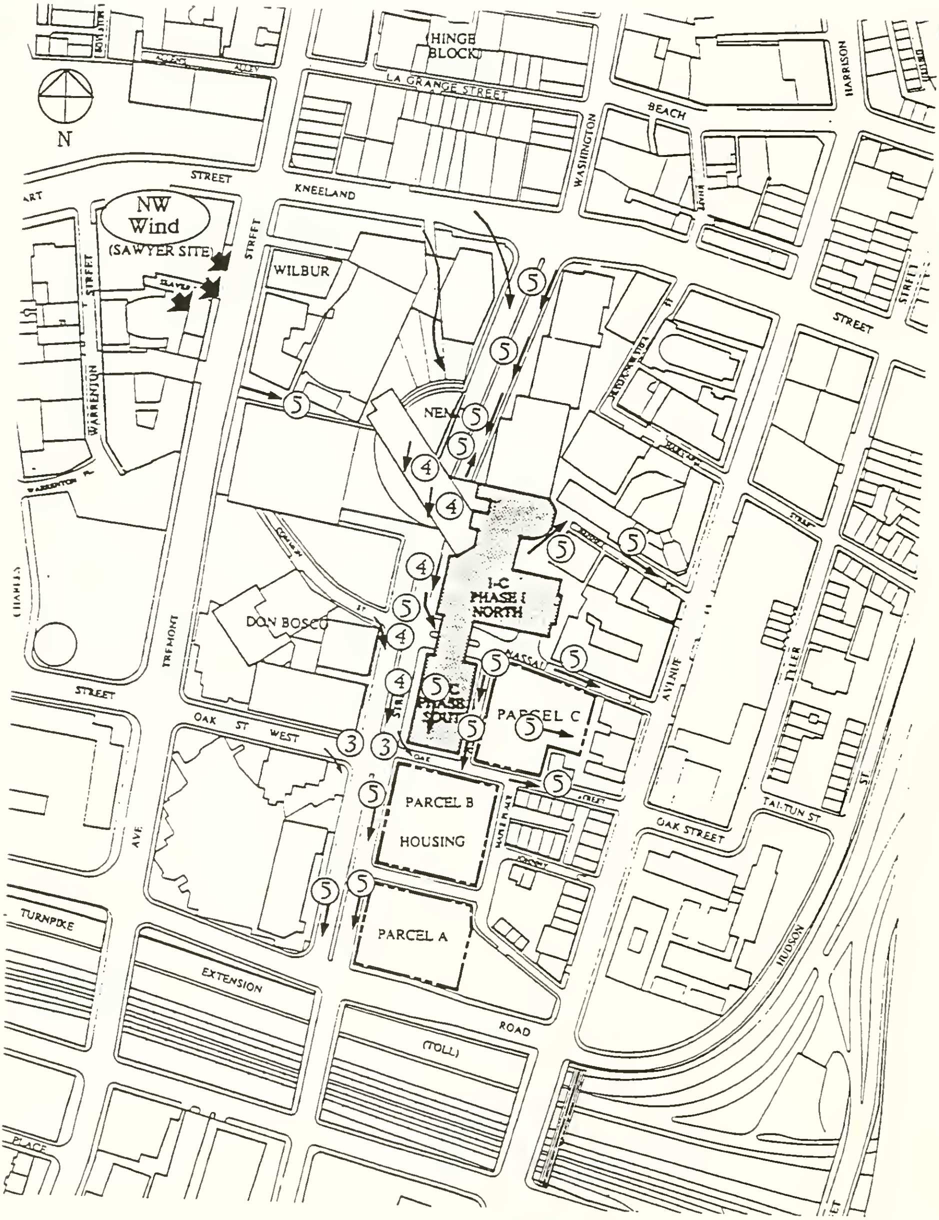


FIGURE 12. WIND STUDIES: Northwesterly Wind, built conditions

N.T.S.

All of Ash Street and Oak and Nassau Streets on the east side of Washington Street will be in the lee of the North and South Buildings for NW winds. Thus the winds in this area along will be very light (Category 5). This will also be true for the entrance to the South Building on Ash Street. Finally, Bennet Street or the small park that will eventually replace it will have essentially no wind at street level for NW winds (Category 5).

5.3. SOUTHWEST (SUMMER) WINDS (FIGURES 13 AND 14)

5.3. 1. Introduction

The prevailing winds in the summer are from the SW. SW winds approach the site diagonally and perpendicular to the SW facing facade of Floating Hospital. It should be born in mind that, on hot summer days, some windiness may be desirable.

5.3.2 Existing Conditions in SW Winds (Figure 13)

For SW winds the entire section of Washington Street between the Floating Hospital and Kneeland Street is in the lee of the Floating Hospital and thus quite calm (Category 5), except near the SE corner of the Nutrition Building (Category 4). There is essentially no wind in either the Washington-Tremont Street Concourse or the pedestrian passage way between Washington and Bennet Streets (Category 5). It is quite windy under Floating Hospital (low Category 3),, but because it is setback the main entrance to Floating Hospital is not windy (Category 5). The clasic vortex formed just south of and in front of Floating Hospital causes a north wind to blow down Washington Sreet on both sides of the Street for a little way south of Floating Hospital (Cateory 4). To the south beyond this slightly windy area Washington Street is calm all the way to Hudson Road (Category 5) because it is in the lee of Don Bosco School, the 17story appartment house on Oak Street, and the Josiah Quincy Elementary School on the west side of Washington Street.

Currently for SW winds, the breezes along Oak Street to the east of Washington Street between Washington and Ash Streets are light (Category 5), and will remain so when the Parcel B Housing is built. The winds on the sidewalks next to the parking lot on the east side of Ash Street between Oak and Nassau Streets will also be in Category 5. The winds along the rest of Ash Street up to Bennet Street are also light (Category 5). Bennet Street is completely shielded from SW winds and so is totally Calm (Category 5).

Thus the only places near the site that are noticably windy for SW winds are the sidwalks under Floating Hospital which are in Category 3.

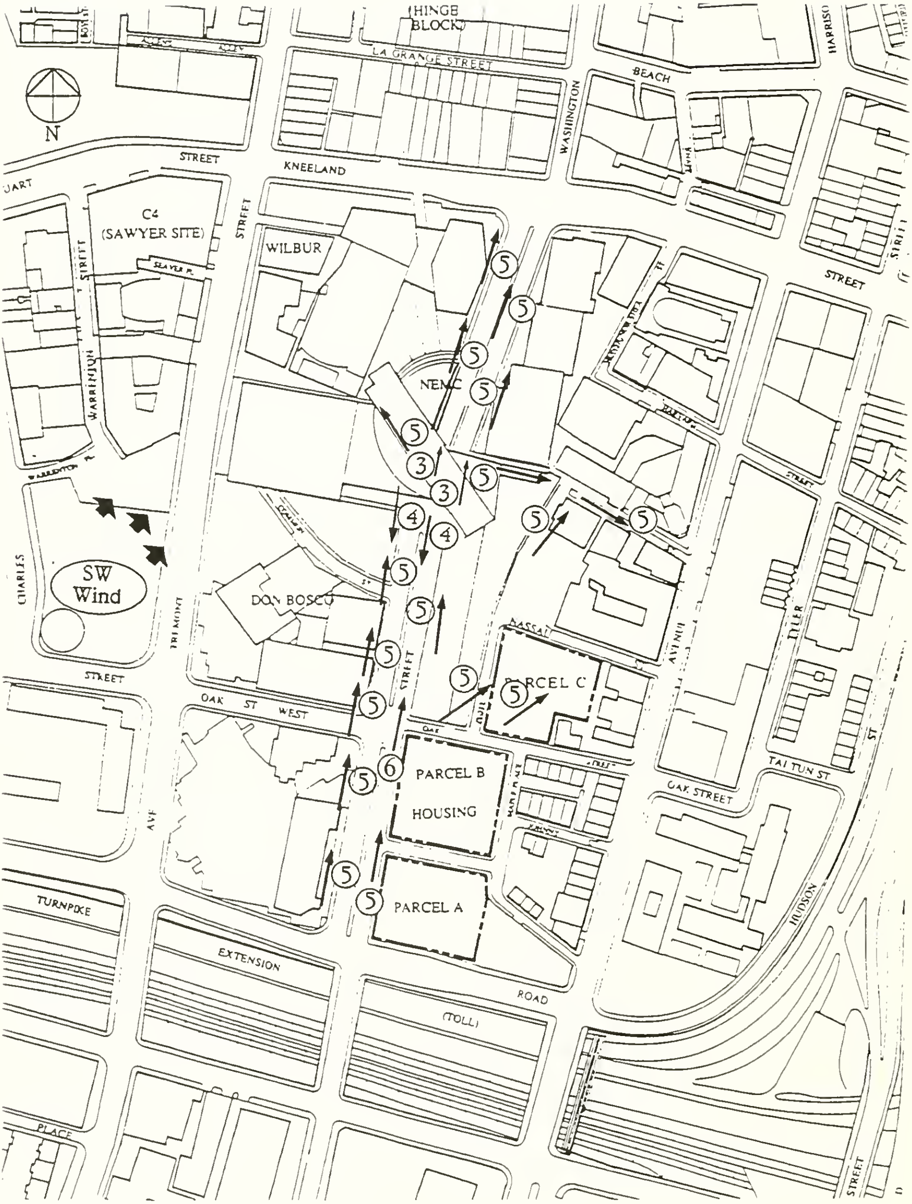


FIGURE 13. WIND STUDIES: *Southwesterly Wind, Existing Conditions* N.T.S.

5.3.3 Build Conditions for SW Winds (Figure 14)

Adding the North and South Buildings of Project 1-C will make almost no difference to the winds in Washington Street north of Floating Hospital. Nor will these two buildings effect the winds in the Open Concourse between Washington and Tremont Streets. However, when this concourse is closed in, as planed, there will be noticable winds blowing north along the sidewalk next to the entrance to the Concourse on Tremont Street (Category 4). This windiness is not effected by either of the Project 1-C buildings. The entrance to the Concourse on Washington Street, as well as the main entrance to Floating Hospital next to it, are both set back far enough from Washington Street that neither will be windy (Category 5).

The currently open passsageway from Washington to Ash Streets will be closed and lead to the large Atruim connecting the Proger, Floating Hospital and the new North Building. The entrance to the closed passageway from Washington Street will be setback considerably so that winds at that entrance will be calm (Category 5). The other entrances to the Atrium will be off Bennet and Ash Streets and in the lee of the buildings and so not windy (Category 5).

For SW winds, the presence of the North and South Buildings of Phase 1 of the 1-C Project will enhance the entrapment of the high pressure created as the SW wind is stoped at the south facade of Floating Hospital and to the west of the North and South Buildings. The result will be that the winds under Floating Hospital will be increased, but still in Category 3. As noted above, because of its setback, winds at the main entrance to Floating Hospital will remain calm (Category 5).

The entraped high pressure air to the SW of Floating Hospital will result in a similar, but stronger vortex than the one for the existing conditions. This will result in the reverse wind to the SW of Floating Hospital along both the east and west sides of Washington Street being increased, but still in Category 5. The door to the North Building just to the south of Floating Hospital will probably be in the area of this reverse flow so that winds near it will be light (Category 5). On the other hand, the winds along the sidewalk on the east side of Washington Street will probably be increased to Category 4, especially in front of the South Building. The setback of the entrance to the South Building will prevent it from being windy (Category 5). There will be noticable winds in the underpass between the North and South Buildings (Category 4).

Along Oak Street between Washington and Ash Streets there will be some wind, especially near the SE corner of the 1-C South Building (Category 3). There will be little or no wind on the side walks around the parking lot boardered by Oak, Ash, and Nassau Steeets and May Place (Category 5). The entrance to the South Building on Ash Sreet and the sidewalk near it will be calm (Category 5), since both are in the lee of the South Building for SW winds. Of course the north end of Ash Street and Bennet Street or the small park that will eventually replace Bennet Street will also be calm (Category 5).

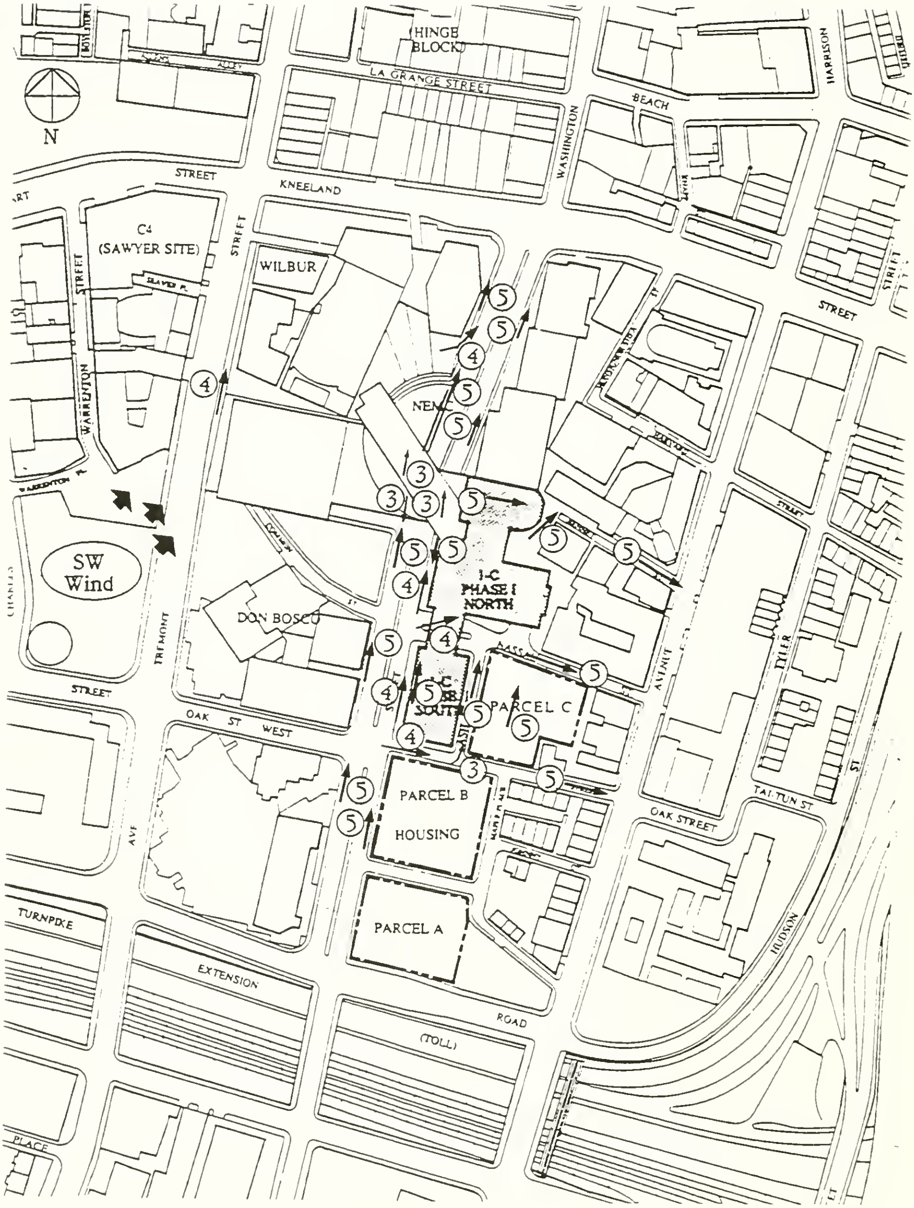


FIGURE 14. WIND STUDIES: *Southwesterly Wind, Built Conditions*

N.T.S.

5.4.0 EASTERLY STORM WINDS (FIGURES 15-20)

5.4.1 Introduction

Easterly winds occur about one third of the time. Light easterly winds occur as a storm starts or in the summer as a sea breeze. During the first 4-12 hours of a typical coastal storm, it rains or snows depending on the temperature, and the wind is from the NE or SE depending on whether the center of the storm passes to the east or west of the city.

Since for strong easterly winds, it will generally be raining or snowing, and people expect it to be windy, the emphasis in the following discussions will be on entering or exiting the various buildings. ALso, because easterly winds cover such a wide range of wind directions, the discussion will cover NE, E, and SE winds separately in that order.

5.4.2 Storm winds for Existing Conditions (Figures 15, 17, and 19)

The most prevalent of the easterly winds are from the NE (Figure 15). NE winds blow directly at the NE face of Floating Hospital and thus diagonally from the intersection of Kneeland Street and Harrison Avenue to the intersection of Oak and Tremont Streets and Shawmut Avenue. In this case, because the Nutrition Center is much taller than the Farr and Proger Buildings, it tends to deflect the NE wind down into Washington Street, and causes some windiness on the east sidewalk near the south end of the Nutrition Building (Category 4). Of course, the west side of Washington Street will be in the lee of the Farr and Proger Buildings and calm (Category 5). There is also the suggestion of reversed winds just north of Floating Hospital as was the case for NW winds, but they lighter (Category 5). Winds in the Washington - Tremont Street Concourse are also in Category 5.

There is some acceleration of the winds under Floating Hospital, but again they are lighter (Category 4) than for NW winds. Winds in the pedestrian passageway between Washington and Bennet Streets, as well as at both entrances to it, are light (Category 5). The main entrance to Floating Hospital is quite calm (Category 5).

South of Floating Hospital, Washington Street and the site are in the lee of Floating Hospital, the Proger, the Pratt, the Farmsworth, the Holmes, the NEMCH Rehabilitation, and the Boston Dispensary Buildings, all of which are 50 to 140 feet high and thus act to shelter both areas. However, the sidewalk on the west side of Washington Street beside the Don Bosco School buildings is probably somewhat windy (Category 4). Also, the main entrance to the Quincy Towers which faces Washington Street (Categor 3) and the setback area that serves as the main entrance to the Josiah Quincy Elementary School (Category 3) are probably quite windy.

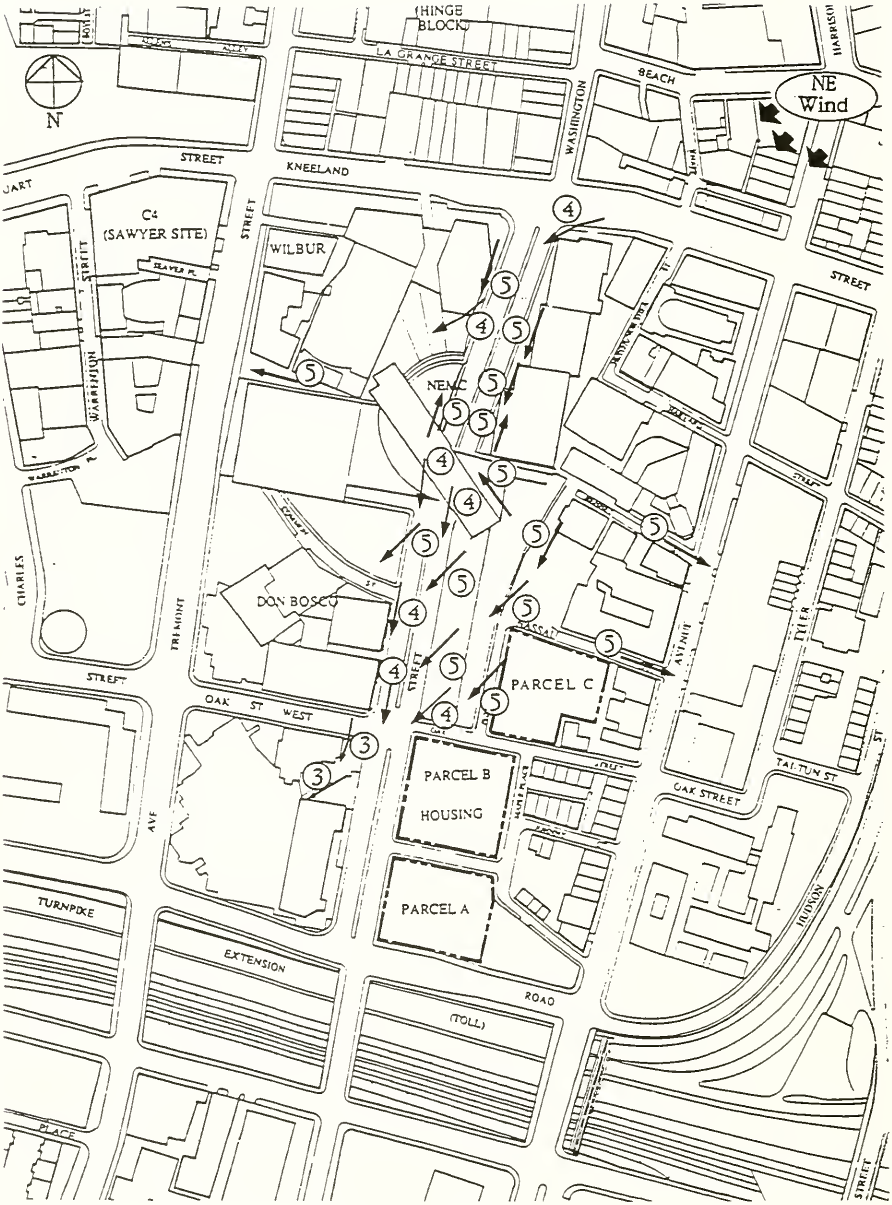


FIGURE 15. WIND STUDIES: *Northeasterly Wind, Existing Conditions* N.T.S.

For NE winds, the windiest part of the actual site is near the south end along Oak Street (furthest from the sheltering buildings), but the winds there are no worse than low Category 4). Of course, the winds along Bennet, Ash, Nassau, and Oak Streets, especially in the vicinity of Ash Street will be very light (Category 5).

East winds blow roughly perpendicular to Washington Street (Figure 17). To the north of Floating Hospital, the only noticably windy areas are probably at the NE and SE corners of the Nutrition Building (Category 4). The Tremont - Washigton Street Concourse, the main entrance to Floating Hospital, and the passageway between Washington and Bennet Streets are all out of the wind (Category 5).

To the south of Floating Hospital, for east winds, the windiest areas along Washington Street are near the NE and SE corners of the Don Bosco Building on the west side of the street (Category 3) and again near the Quincy Tower and in the setback entrance area to the Josiah Quincy Elementary School (Category 3). In front of the 95 foot Don Bosco Building there will be a west wind in the middle of Washington Street (Category 4). The rest of the site including the parking area to the east of Ash Street will be calm (Category 5).

For E winds, the west ends of Bennet and Nassau Streets are calm (Category 5) as is Oak Street near Ash Street and May Place. But the east ends of Bennet and Nassau Streets near Harrison Avenue particularly the entrance to the Farmsworth Building are probably a little windy (Category 4).

SE winds blow paralllel to the long axis of Floating Hospital, i.e. from the intersection of Oak Street and Harrison Avenue to the intersection of Tremont and Stuart Streets (Figure 19). Washington Street north of Floating Hospital to Kneeland Street is completely in the lee of the Proger and Farr Dental Buildings (Category 5). Winds in the Tremont - Washington Street Concourse, at its entrances, at the main entrance to Floating Hospital, and at the entrances to and in the passageway between Washington and Bennet Streets are all light (Category 5).

South of Floating Hospital on Washington Street, for SE winds, again the NE corner of the 95 foot Don Bosco Building on Washington Street south of Floating Hospital and the sidewalk beside the building are probably somewhat windy (Category 4). Also, the main entrance to Quincy Towers off Washington Street is probably windy (Category 4), but not the setback area that leads to the main entrance to the Josiah Quincy Elementary School (Category 5).

For SE winds the many 30 to 50 foot buildings upwind of the site tend to shield it and the parking lot to the east of Ash Street from these winds (Category 5). The east ends of Nassau and Bennet Streets are not windy (Category5), but the entrance to the Farnsworth Building probably is (Category4).

5.4.3 Storm winds for Build Conditions (Figures 16, 17, and 20)

For Build conditions and NE winds, (Figure 16) the winds in Washington Street to the north of Floating Hospital will remain unchanged from existing conditions. There will be some additional acceleration of the winds under Floating Hospital, but again, they will be lighter (Category 4) than for NW winds. If the Tremont - Washington Street Concourse remains as is, winds in it and at its entrances will remain calm (Category 5). If it is completed, it will be closed in, and the entrances on both Washington and Tremont Streets will be clam (Category 5). The pedestrian passageway between Washington and Bennet Streets will be enclosed and the winds at the entrances on both Washington and Bennet Streets will have very light winds (Category 5). The main entrance to Floating Hospital will remain quite calm (Category 5). The entrance to the new Atrium under Floating Hospital will be calm (Category 5).

South of Floating Hospital, for NE winds, Washington Street will be the lee of the new buildings and Floating Hospital, all of which are 140 feet high and thus act to shelter the entire street down to and a little beyond Oak Street. Thus the windiness on the sidewalk on the west side of Washington Street beside the Don Bosco School buildings will be reduced (low Category 4). Also, the winds at main entrance to the Quincy Towers which faces Washington Street (Categor 4) and in the setback area that serves as the main entrance to the Josiah Quincy Elementary School (Category 4) will be lessened. Of course, there will be very little wind near the entrance to the North Building just south of Floating Hospital (Category5), or near the main entrance to the South Building (Category 5), both on Washington Street.

For NE winds, the windiest area in the site will be near south end of the South Building along Ash Street (Category 3). The winds at the entrance to the South Building on Ash Street will be in Category 3. Of course, the winds along Bennet, Nassau, and Oak Streets will remain light (Category 5). Winds in the underpass between the north and south buildings will be very modest (Category 5).

For east winds (Figure 18), to the north of Floating Hospital, winds will remain the same as for existing conditions. Also, there will be little on no tendency for winds to develope under Floating Hospital. The Tremont - Washington Street Concourse, if it remains open, will stay calm (Category 5) , and, if it is closed, the entrances on both Washington and Tremont Streets will be have little wind (Category 5). The main entrance to Floating Hospital will experience little wind (Category 5), as will the new entrance to the Atrium under Floating Hospital (Category 5).

Since, east winds blow perpendicular to Washington Street (Figure 18), the two new buildings will provide shelter for all of Washington Street from Floating Hospital to Oak Street. The winds near the NE and SE corners of the Don Bosco Building on the west side of the street (Category 4) and near the Quincy Tower and in the setback entrance area to the Josiah Quincy Elementary School will be reduced (Category 4). The west wind in front of the 95 foot Don Bosco Building in the middle of Washington Street will be essentially eliminated (Category 5). There will be no wind (Category 5) at the entrance to the C1 North

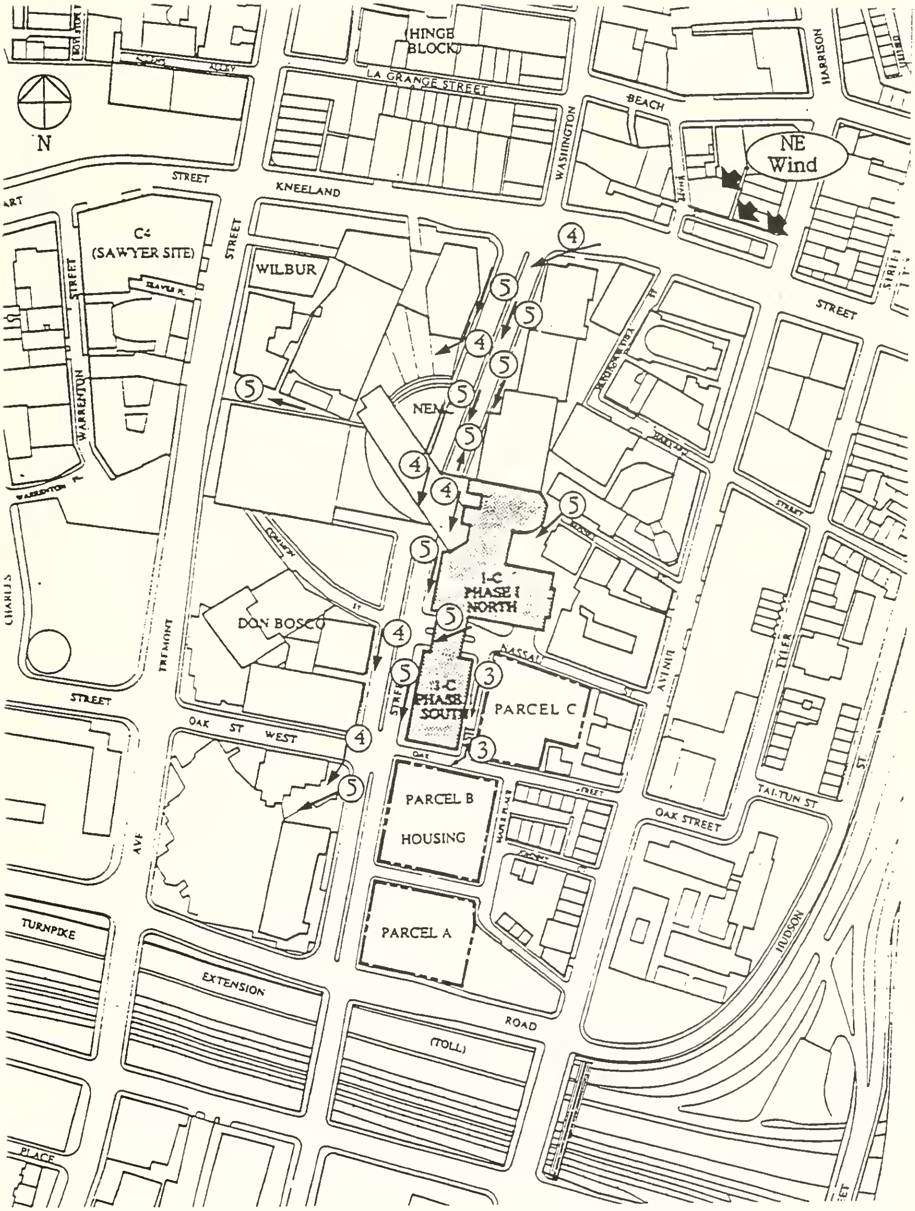


FIGURE 16. WIND STUDIES: Northeasterly Wind, Built Conditions

N.T.S.

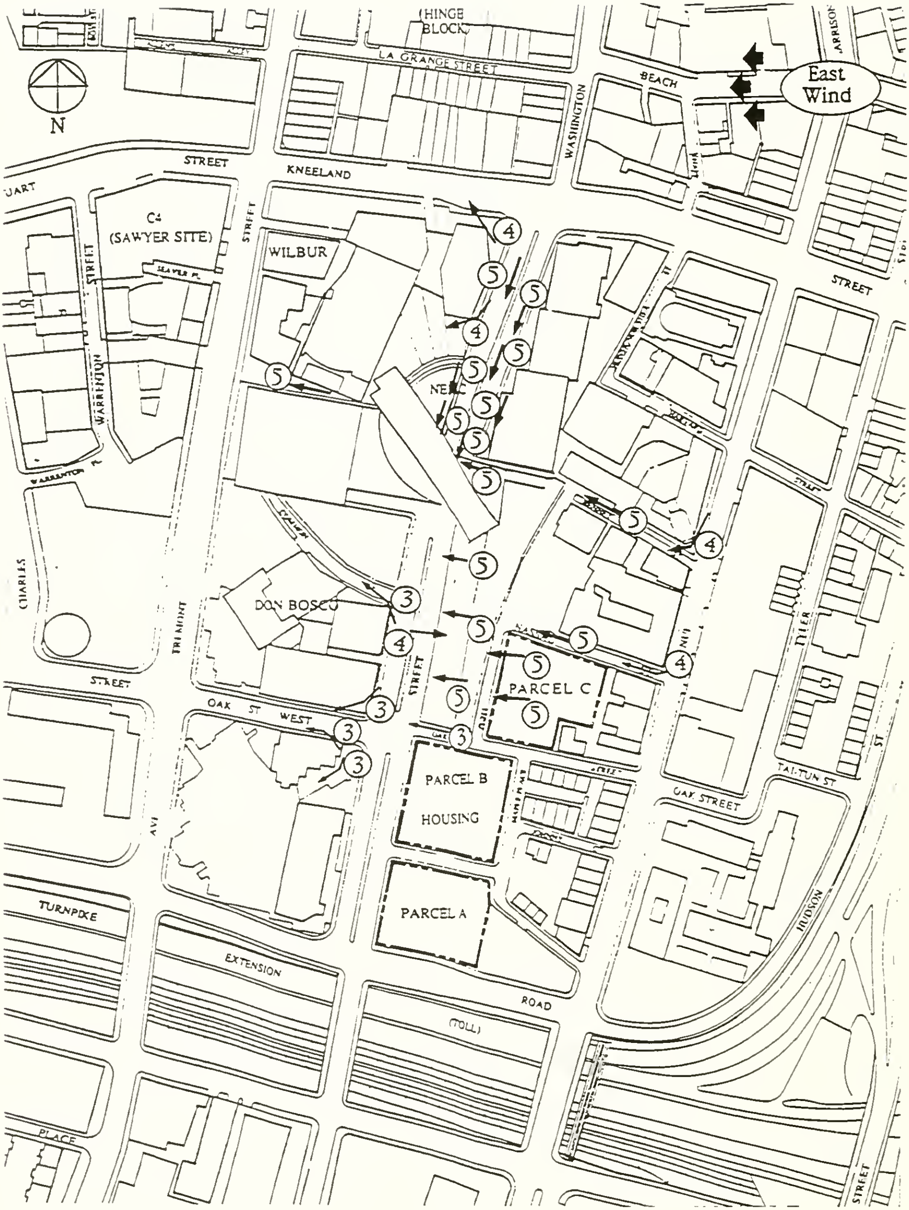


FIGURE 17. WIND STUDIES: Easterly Wind, Existing Conditions *N.T.S.*

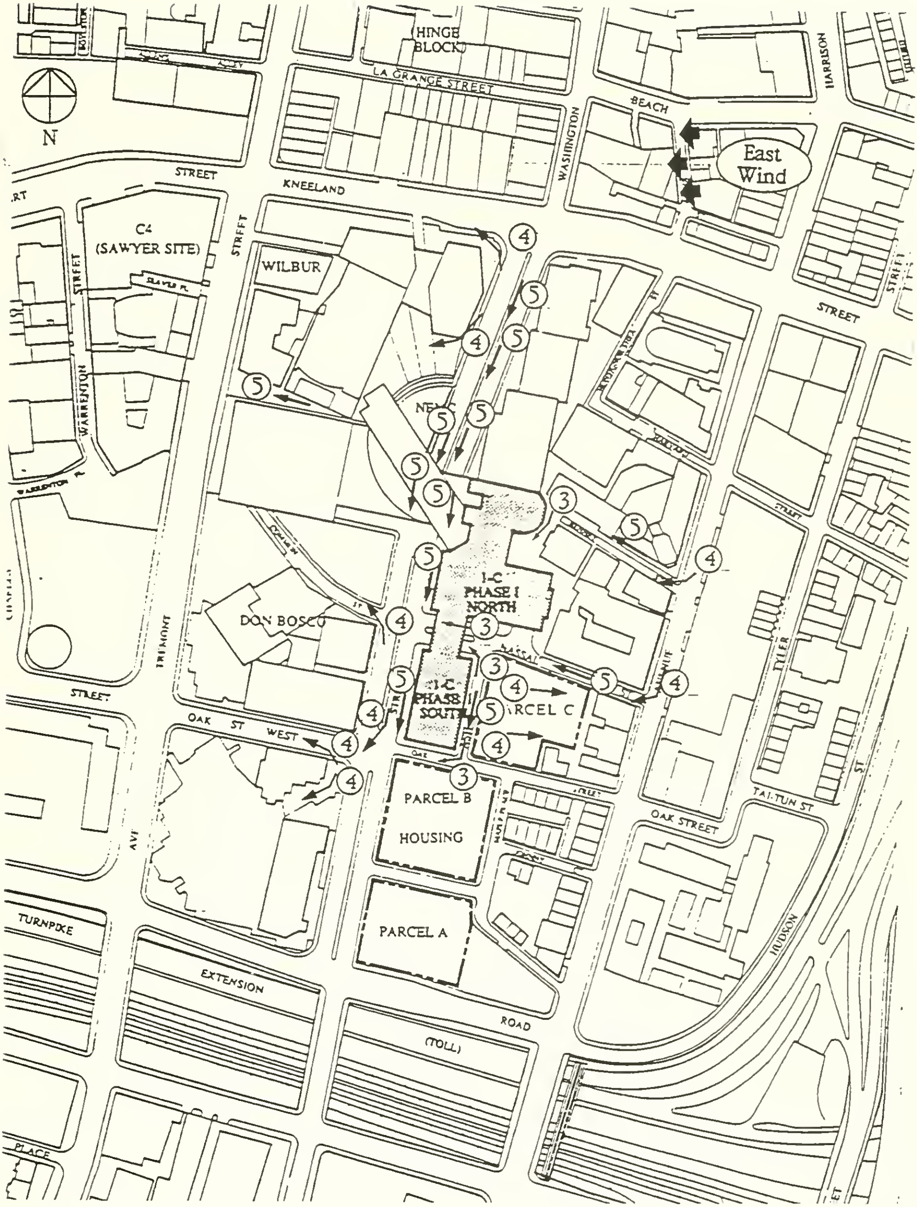


FIGURE 18. WIND STUDIES: Easterly Wind, Built Conditions

N.T.S.

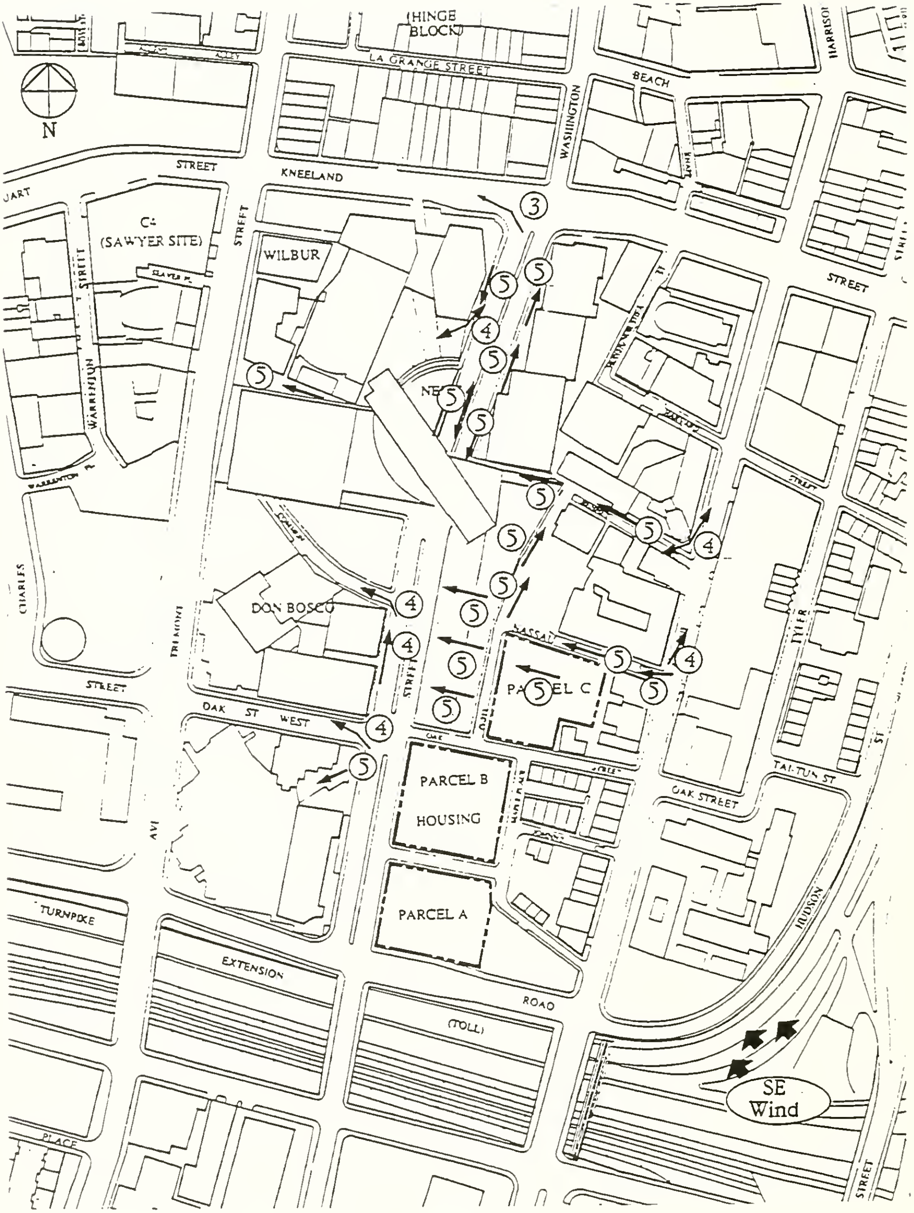


FIGURE 19. WIND STUDIES: *Southeasterly Wind, Existing Conditions* N.T.S.

Building just south of Floating Hospital and at the main entrance to the C1 South Building (Category 5).

For east winds, the entrance to the C1 South Building on Ash Street will be calm (Category 5), but there will be noticable winds near the SE corner of the C1 South Building at the corner of Ash and Oak Streets (Category 3), as well as in the underpass between the North and South Buildings (Category3). There will be a west wind (Category 4) in the parking area to the east of Ash Street.

Winds near the east ends of Bennet and Nassau Streets near Harrison Avenue particularly the entrance to the Farmsworth Building will be unchanged (Category 4).

As noted above, SE winds blow paralllel to the log axis of Floating Hospital, (Figure 20). Washington Street north of Floating Hospital to Kneeland Street will still be completely in the lee of the Proger and Farr Dental Buildings (Category 5). Winds in the Tremont - Washington Street Concourse, if it remains open, will remain calm (Category 5). At its entrances, at the main entrance to Floating Hospital, and at the entrance to the Atrium under Floating Hospital it will be calm (Category 5).

South of Floating Hospital on Washington Street, for SE winds, the winds at NE corner of the 95 foot Don Bosco Building on Washington Street south of Floating Hospital (Category4) and those in the sidewalk beside the building will probably be reduced (Category 4). Those at the main entrance to Quincy Towers off Washington Street will probably be increased slightly, but still in Category 4. The winds in the setback area that leads to the main entrance to the Josiah Quincy Elementary School will be unchanged (Category 5). The entrance to the 1-C North Building, just south of Floating Hospital, and to the 1-C South Building both on Washington Street will be sheltered (Category 5).

For SE winds the SW and NE corners of the 1-C South Building will be somewhat windy (Catetory 4), as will the entrance to 1-C South Building on Ash Street (Category 4). Also the north lane of the Nassau Street underpass will hvae some windiness (Category 4). Winds in the Ash Street Parking lot will remain light (Category 5).

The east ends of Nassau and Bennet Streets will remain not windy (Category 5), but the entrance to the Farnsworth Building will remain in Category4. When Phase two of the 1-C project is completed Bennet Street will be replaced by a triangularly shaped open area. The east and wider end of the area will be open and thus somewhat windy for easterly winds (Category 4). Winds near the entrance to the Farnsworth Building will be increased slightly, but still in Category 4.

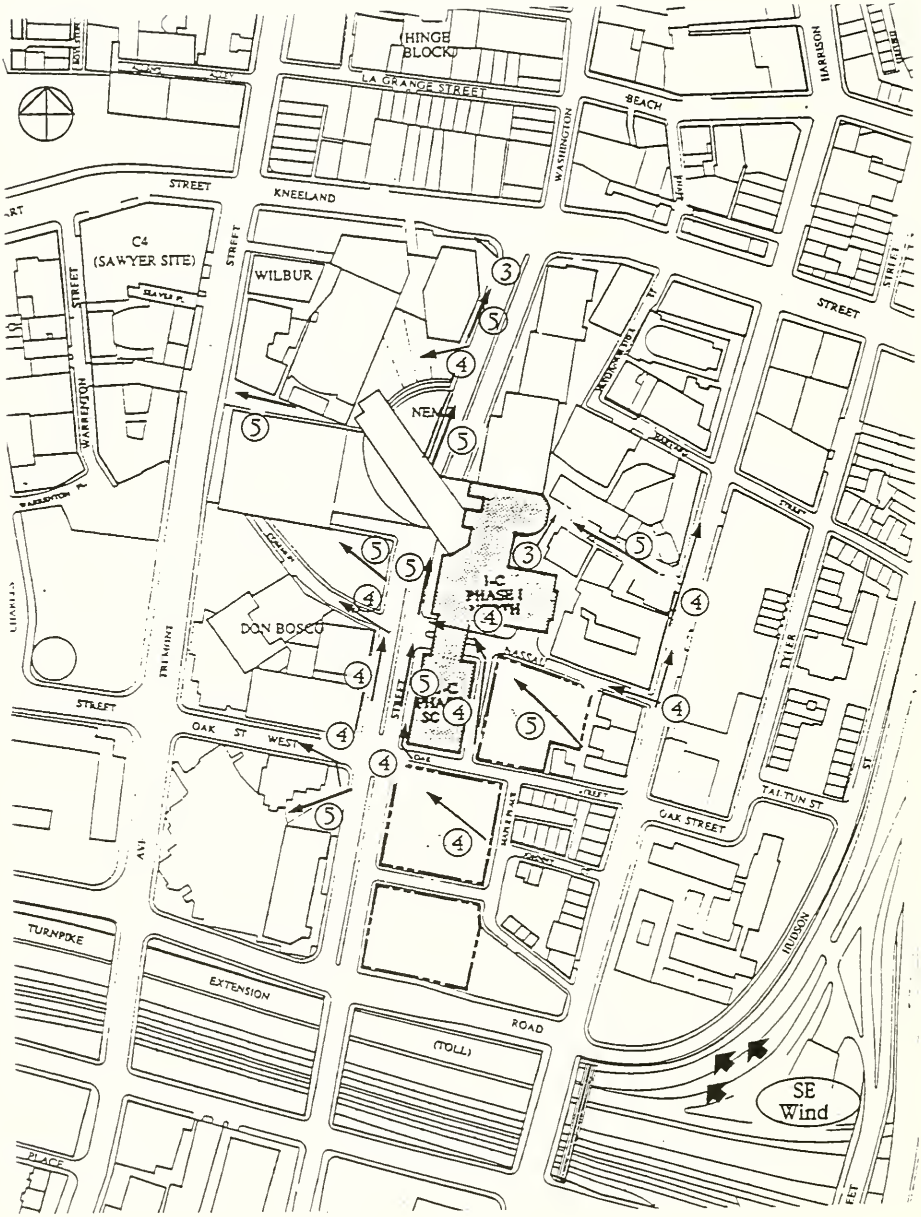


FIGURE 20. WIND STUDIES: *Southeasterly Wind, Built Conditions* N.T.S.

6.0 SUMMARY AND CONCLUSIONS

An assessment has been made to determine the effect the proposed NEMCH Project 1-C Phase 1 North and South Buildings on PLWS in and near the site of the proposed buildings. Currently there is no place in the site or its immediate surrounding area that has excessive PLWs (i.e. PLWs in Melbourne's Categories 1 or 2) or exceeds the the BRA guideline return period effective gust wind speed of 31 mph once in 100 hours. Today the windiest places in and near the site are under Floating Hospital where, for SW winds, PLWs are in Category 3, at the NE corner of the 95 foot Don Bosco Building on Washington Street, where for easterly winds, PLWs are in Category 3, and near the entrances to the Quincy Towers and the Josiah Quincy Elementary School, where again for easterly winds, PLWare in Category 3.

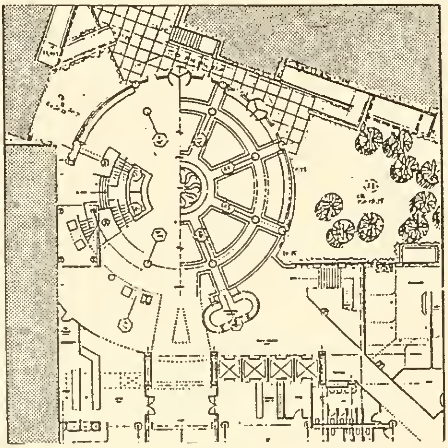
Adding the proposed new buildings reduces the PLWs in the latter two areas and leaves those under Floating Hospital essentially unchanged. Although, the new buildings create some windiness near the south corners of the new South Building, no areas are expected to have PLWs in Categories 1 or 2 or that exceed the BRA guideline wind Speed. Further all entrances, new, old, or moved will have PLWs no worse than Category 4 as an average.

It is concluded that, the addition of the 1-C Phase 1 North and South Buildings and Atrium to the site, will not have significant adverse effects on PLWs in or near the site.

7.0 REFERENCES

1) Davenport, A.G., and Isyumov, N., " The Application of the Boundary Layer Wind Tunnel to the Prediction of Wind Loading" , Proceedings of Intl. Seminar on Wind Efects on Buildings and Structures, Ottawa, Canada, September, 1967.

2) Melbourne, W.H., "Criteria for Environmental Wind Conditions", Journal of Industrial Aerodynamics, Vol.3, 1978, pp 241-249.



Appendix E: Shadow

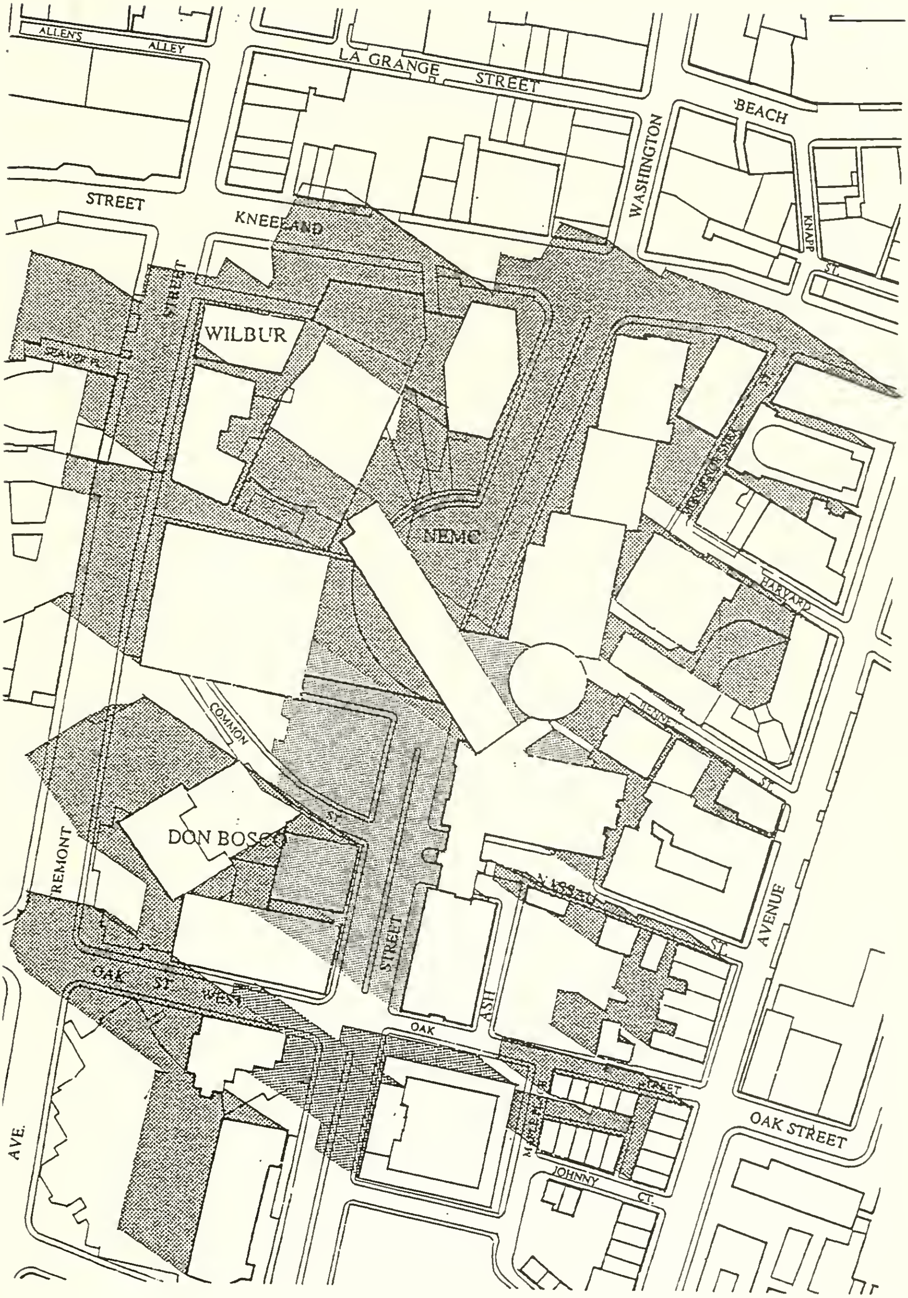


FIGURE 1. SHADOW STUDIES: March 21, 9:00 A.M. EST N.T.S.

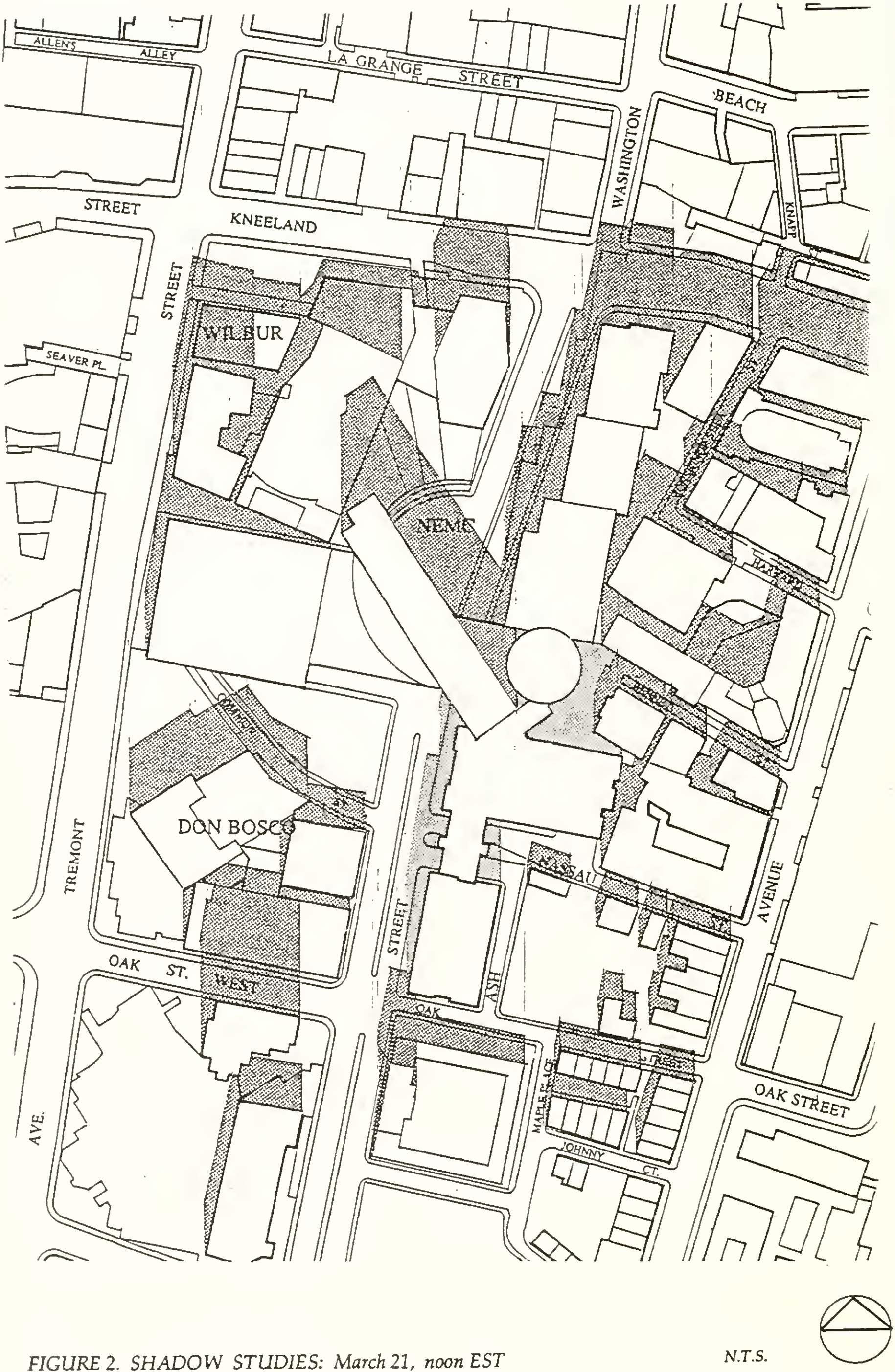


FIGURE 2. SHADOW STUDIES: *March 21, noon EST* N.T.S.

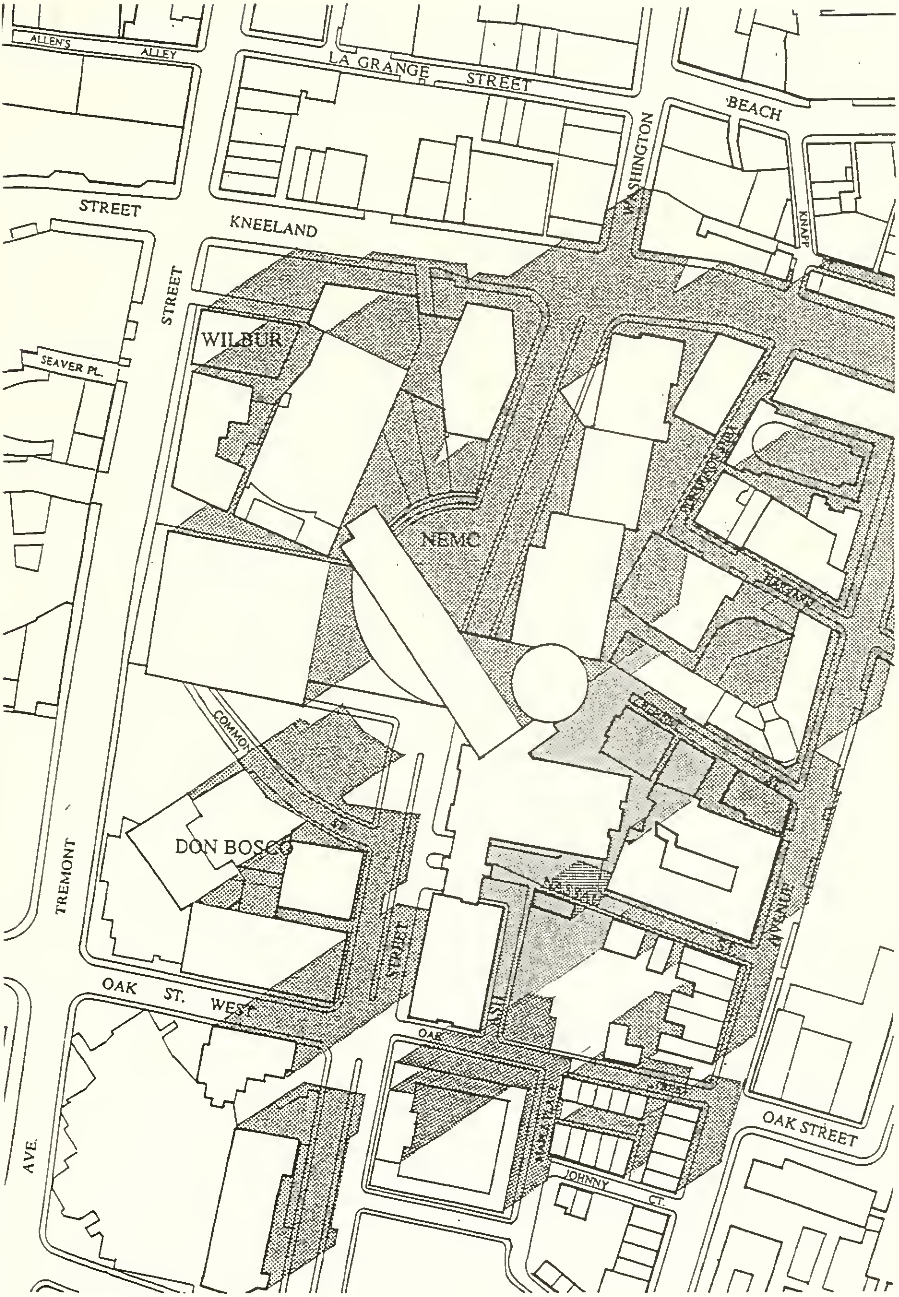


FIGURE 3. SHADOW STUDIES: March 21, 3:00 P.M. EST

N.T.S.

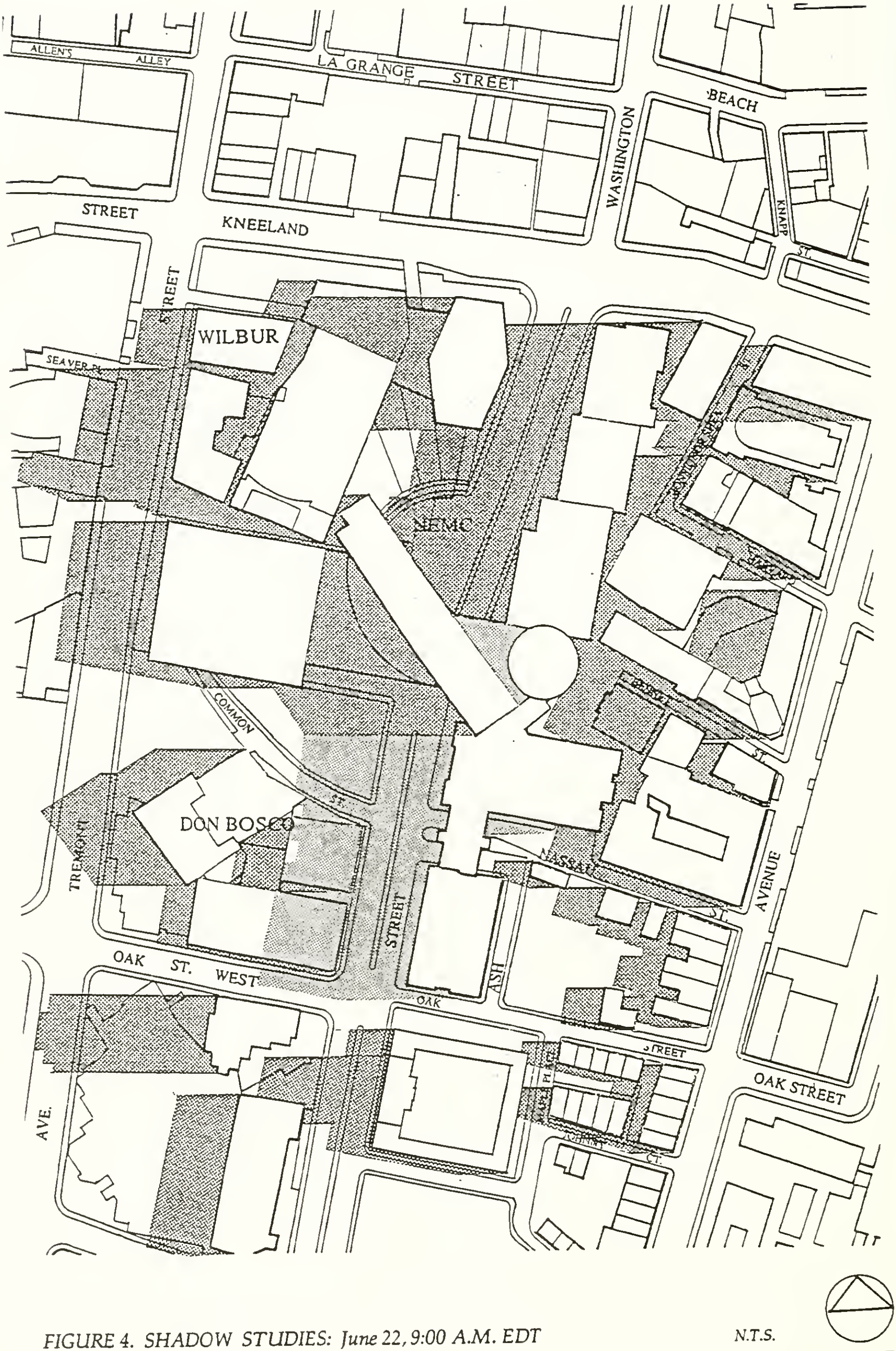


FIGURE 4. SHADOW STUDIES: *June 22, 9:00 A.M. EDT* N.T.S.

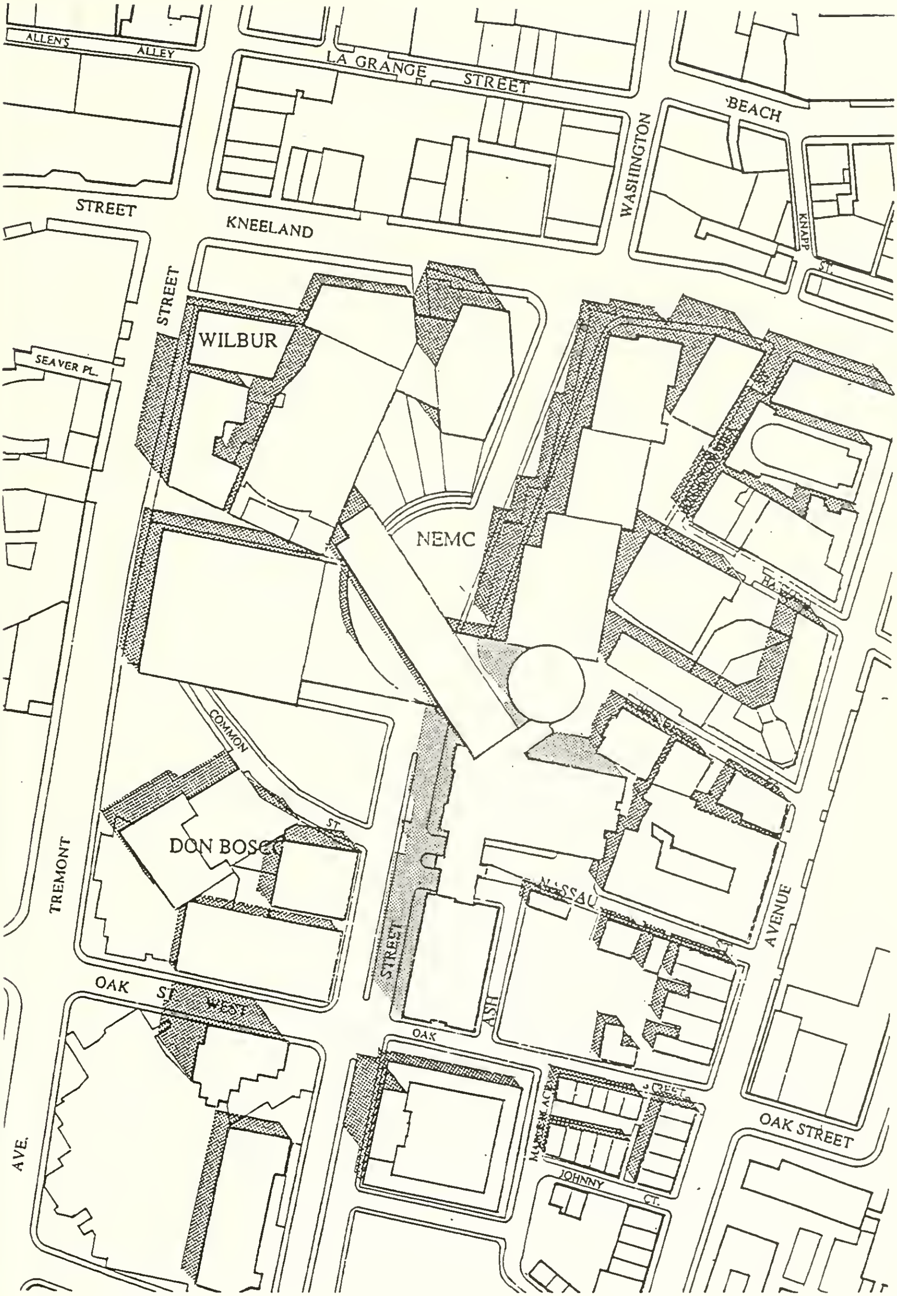


FIGURE 5. SHADOW STUDIES: *June 22, noon EDT*

N.T.S.

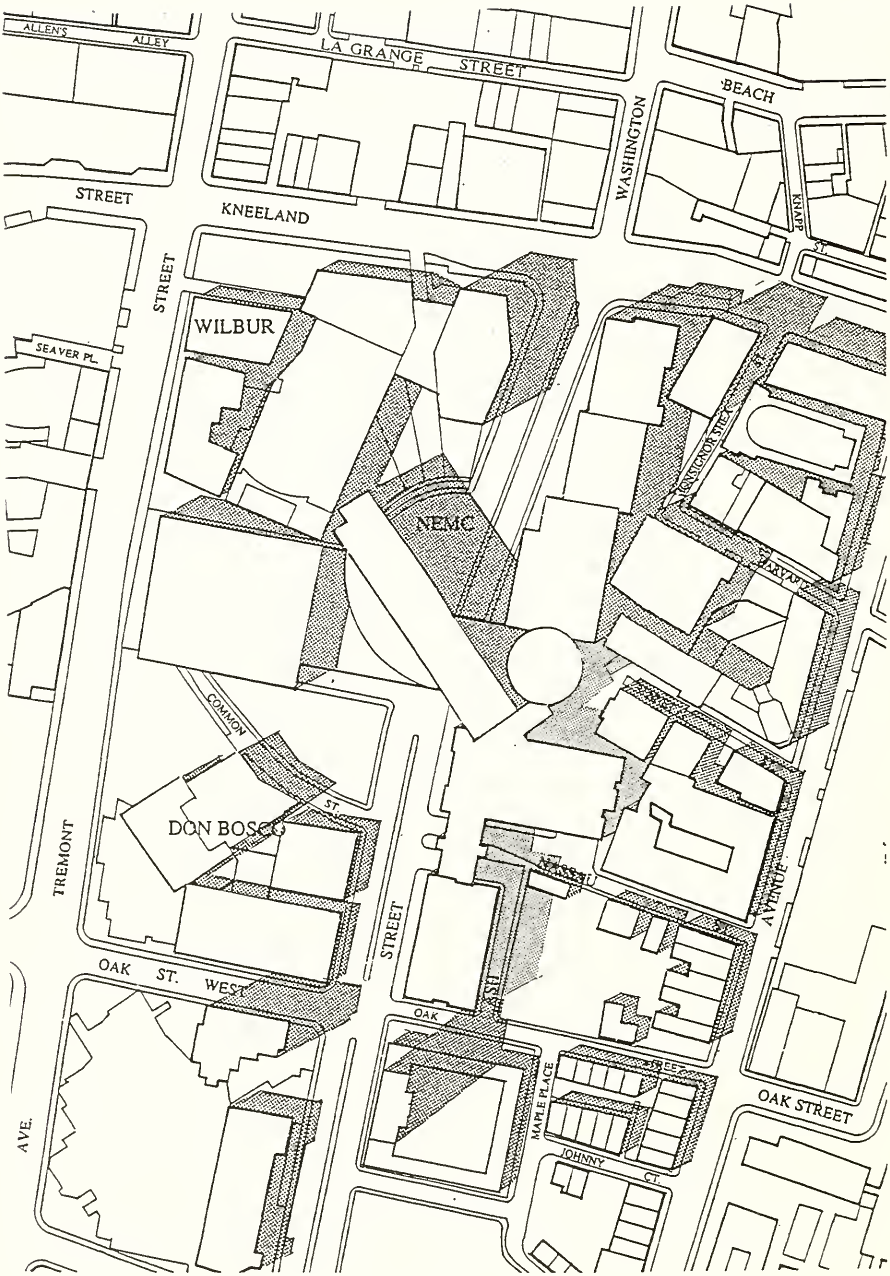


FIGURE 6. SHADOW STUDIES: June 22, 3:00 P.M. EDT N.T.S.

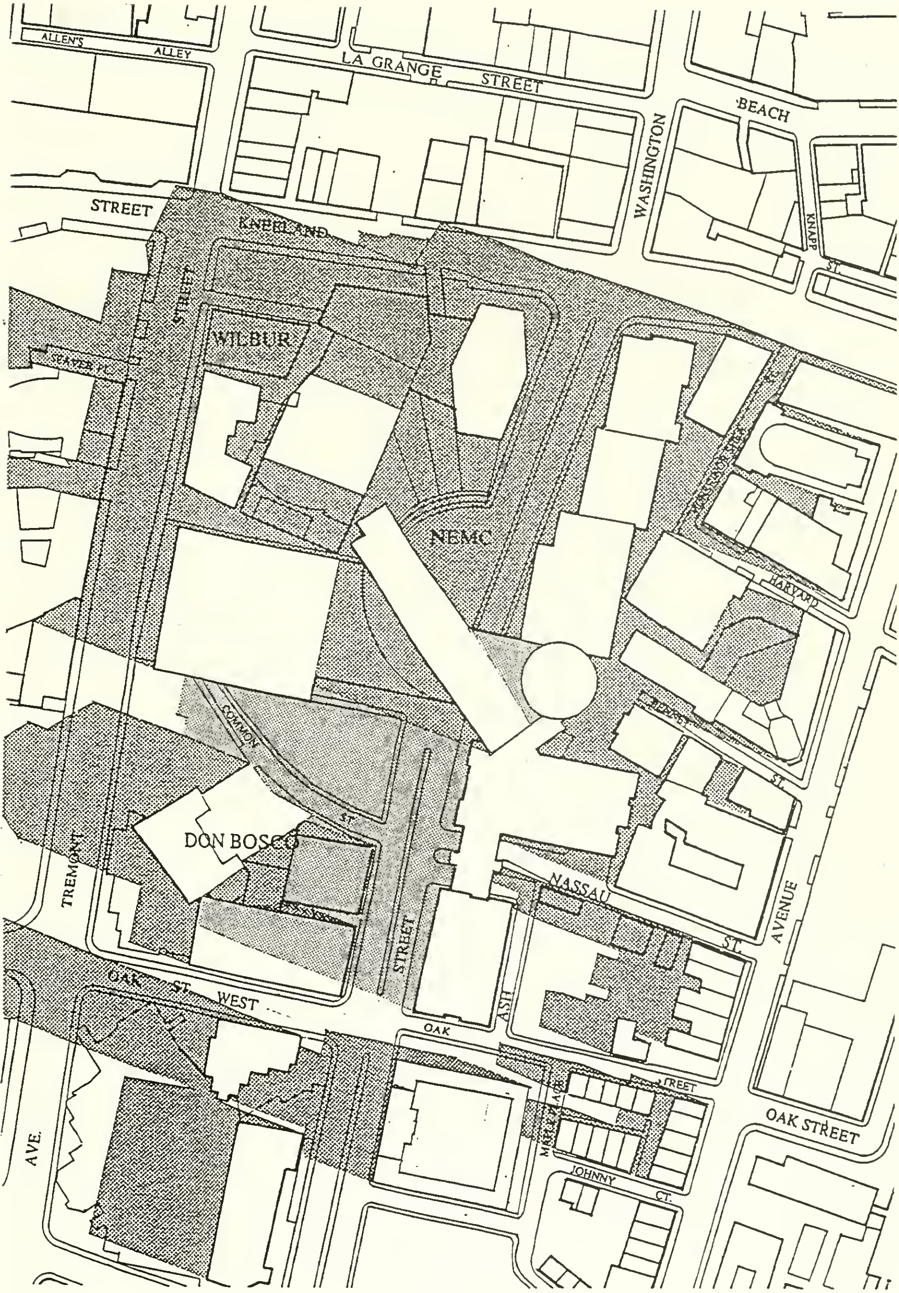


FIGURE 7. SHADOW STUDIES: September 23, 9:00 A.M. EDT

N.T.S.

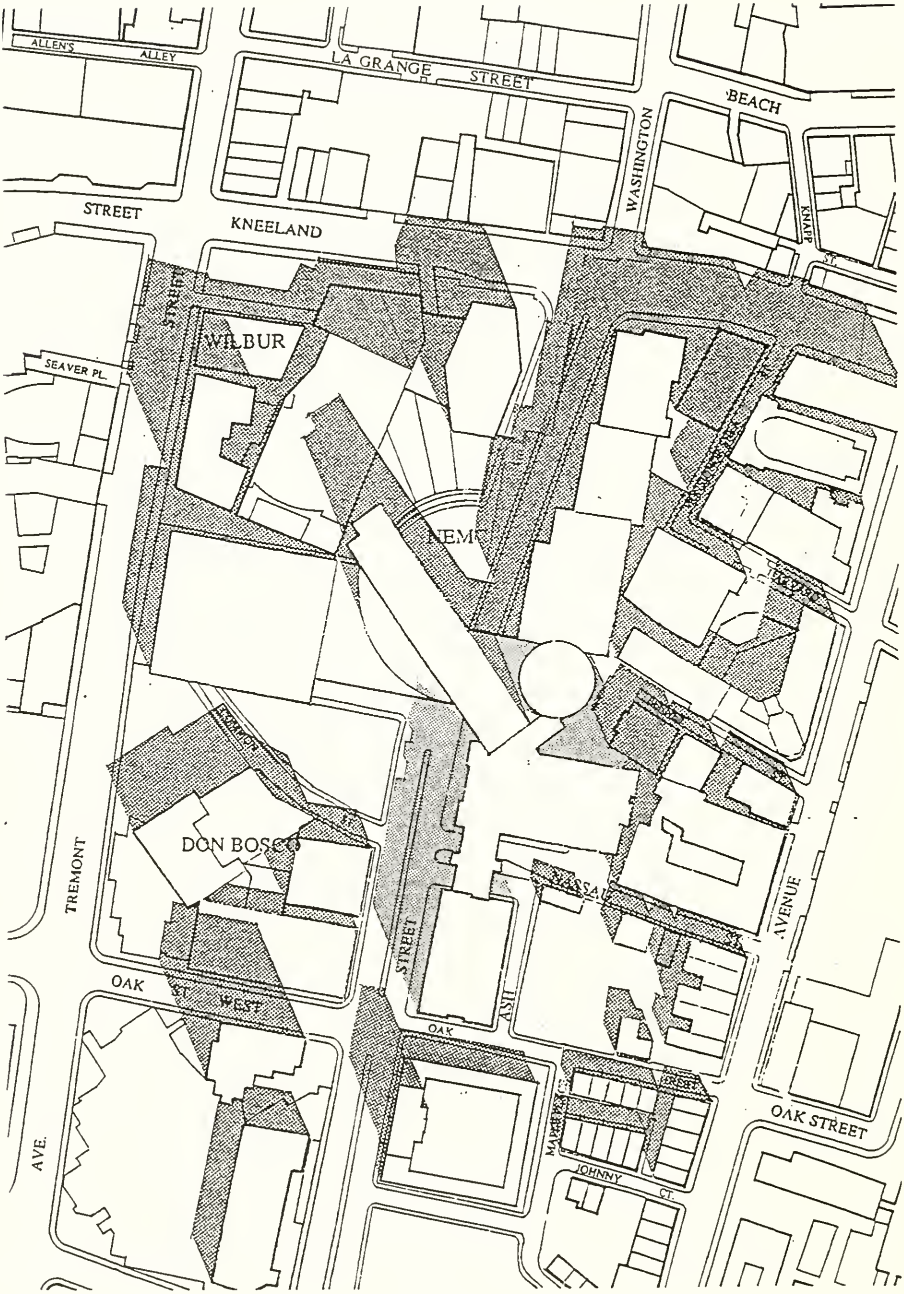


FIGURE 8. SHADOW STUDIES: *September 23, noon* EDT

N.T.S.

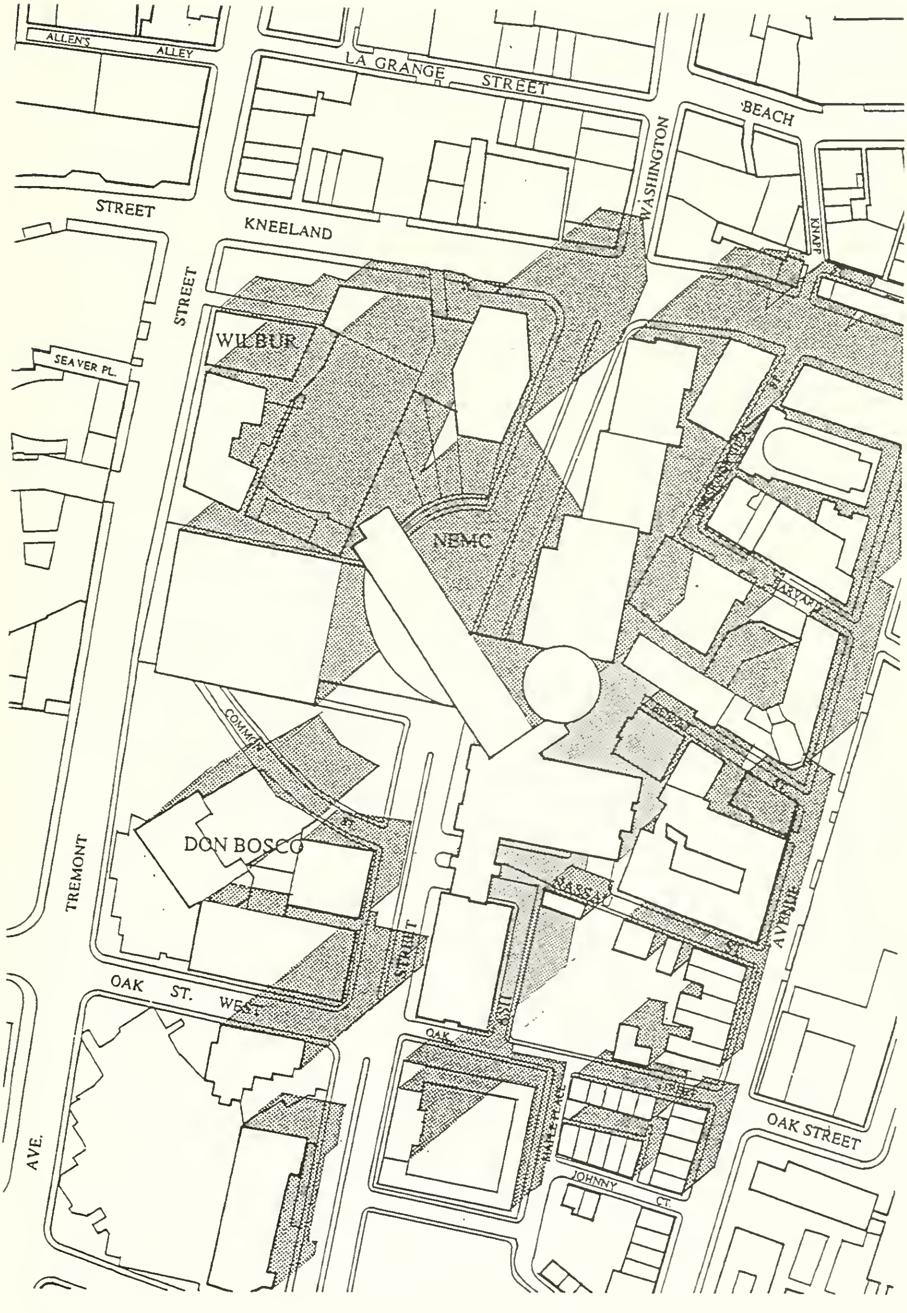


FIGURE 9. SHADOW STUDIES: September 23, 3:00 P.M. EDT N.T.S.

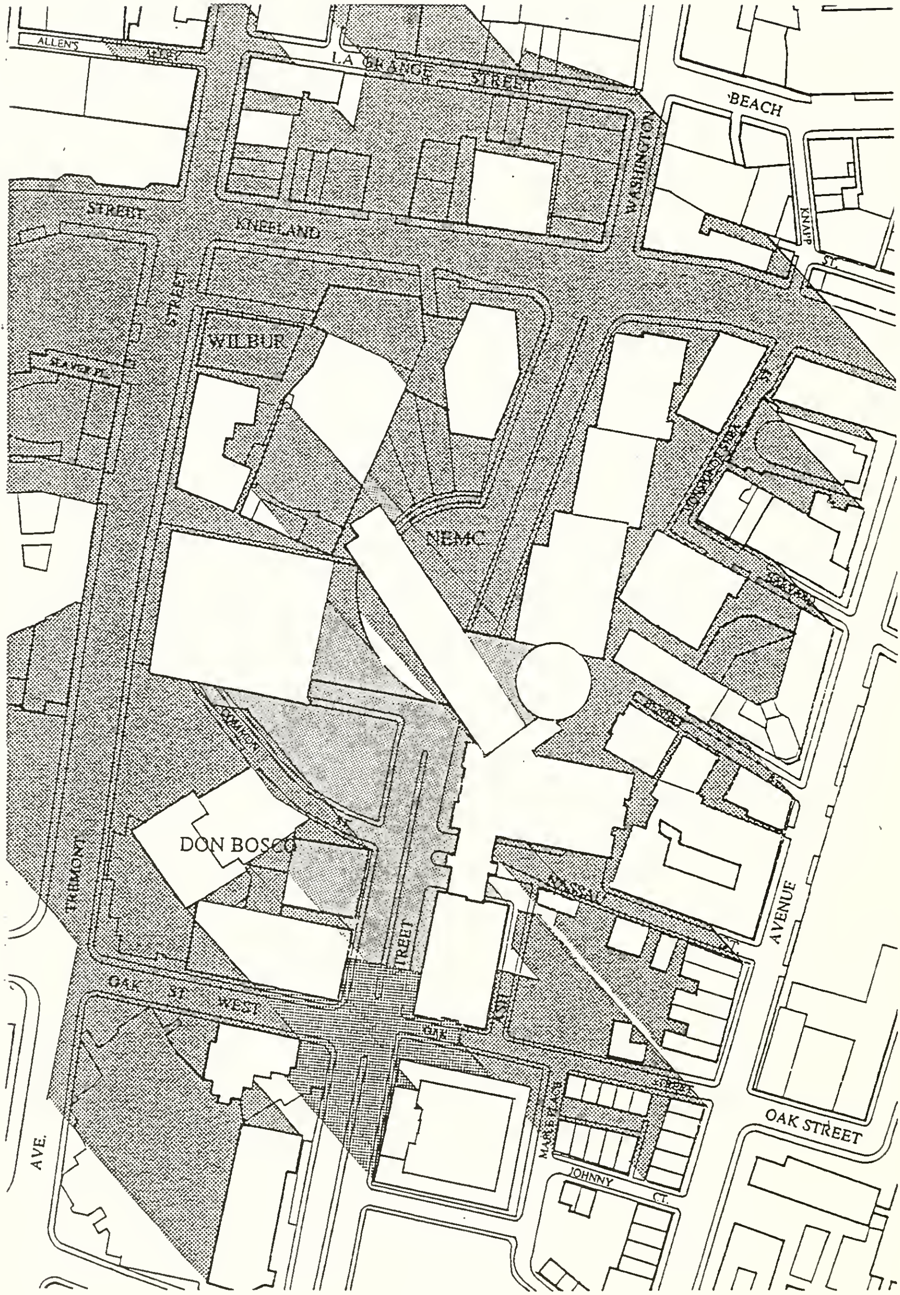


FIGURE 10. SHADOW STUDIES: December 22, 9:00 A.M. EST

N.T.S.

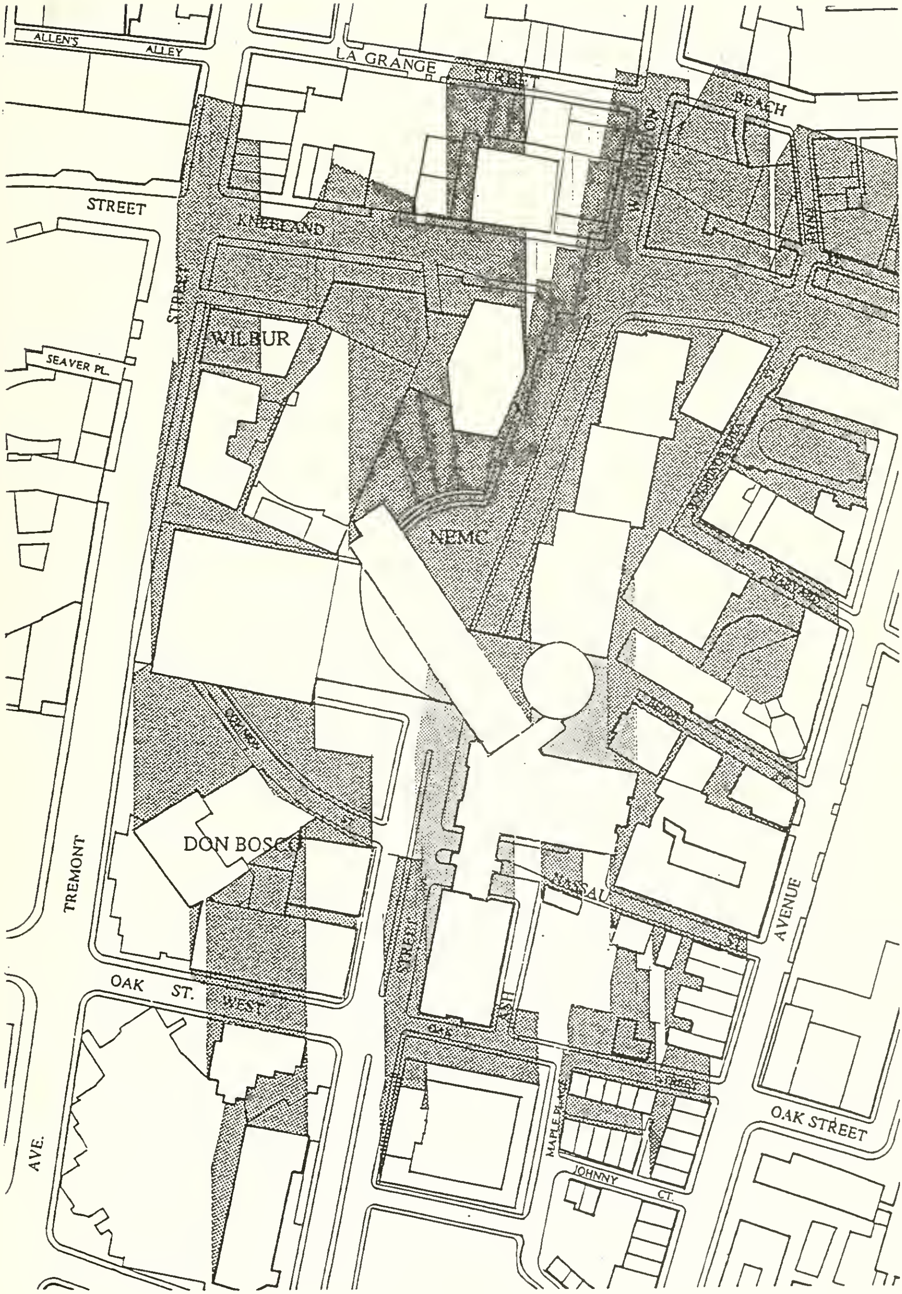


FIGURE 11. SHADOW STUDIES: December 22, noon EST

N.T.S.

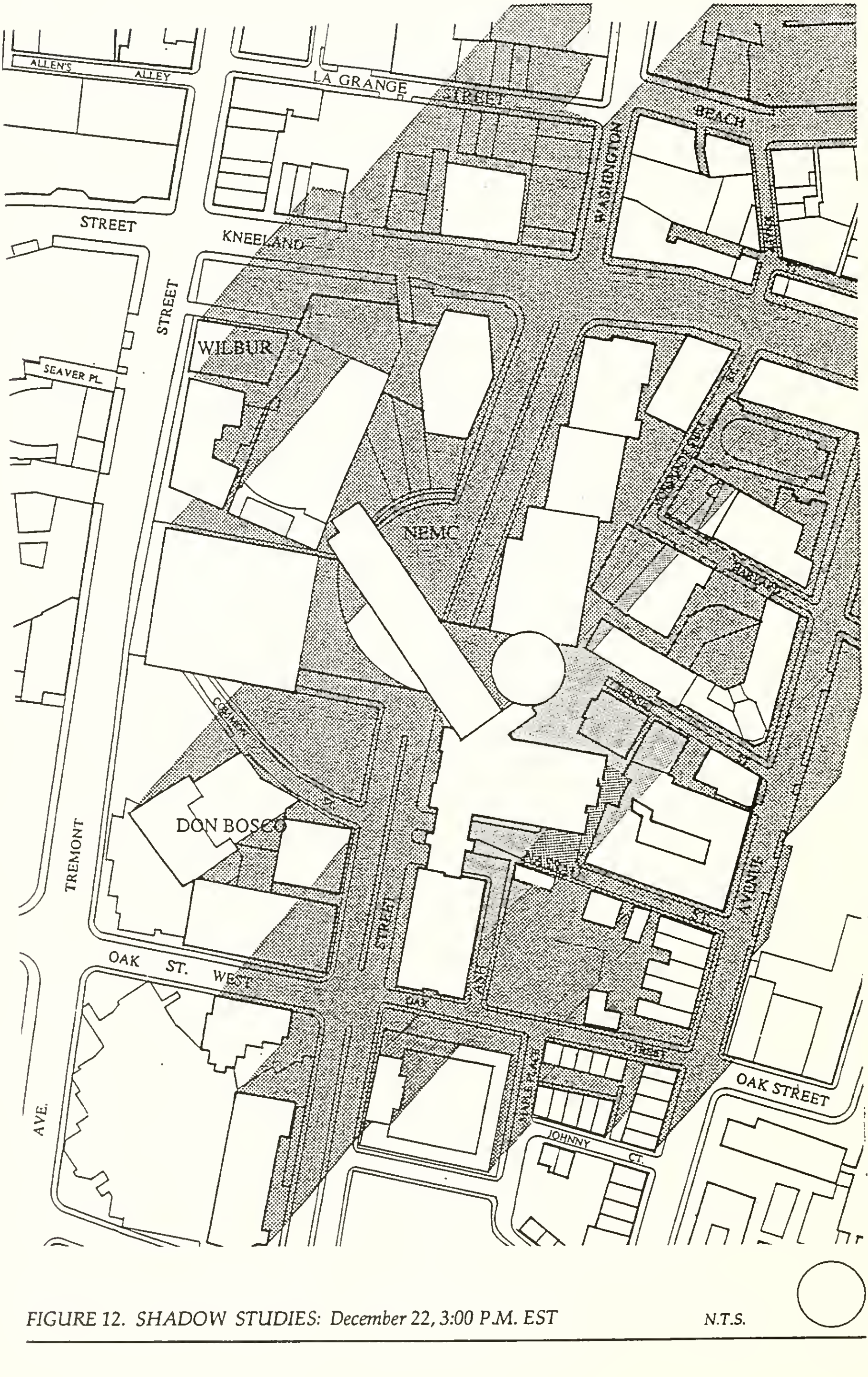
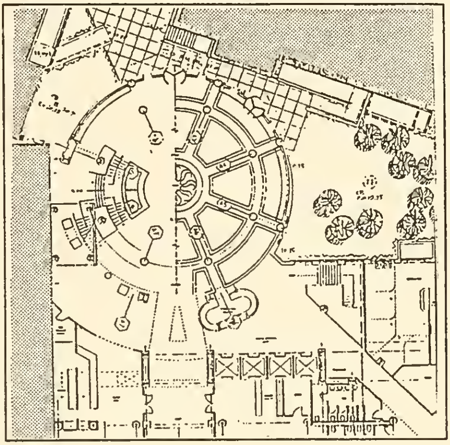


FIGURE 12. *SHADOW STUDIES: December 22, 3:00 P.M. EST* N.T.S.



Appendix F: Daylight

```
PROJECT DATA
------- ----

PROJECT NAME :  New England Medical Center

BUILDING LOCATION :  Boston, MA

ARCHITECT / DEVELOPER :  NEMC

DATE :  23 March 1992

COMMENTS :  Don Bosco Analysis


SITE CHARACTERISTICS
---- ---------------

Width of street :  88

Distance from street edge to front property line :  0

Width of property :  195


BUILDING CHARACTERISTICS
-------- ---------------

LAYER 1

    Distance back from front property line :  0

                                                 LAYER COORDINATES
        FROM          DIRECTION    DISTANCE    HORIZ(X)  VERT(Y)        IS NOW
    --------------    ---------    --------    -----------------    ------------
    left prop line      right         115         115        -            -
       ground            up             0         115        0        corner  1
      corner  1          up            80         115       80        corner  2
      corner  2         right          65         180       80        corner  3
      corner  3         down           80         180        0      end of layer

LAYER 2

    Distance back from layer 1 :  10

                                                 LAYER COORDINATES
        FROM          DIRECTION    DISTANCE    HORIZ(X)  VERT(Y)        IS NOW
    --------------    ---------    --------    -----------------    ------------
    left prop line      right          10          10        -            -
       ground            up             0          10        0        corner  1
      corner  1          up            35          10       35        corner  2
      corner  2         right          95         105       35        corner  3
      corner  3         down           35         105        0      end of layer


                                                                   run code 208c2
```

```
Reflectance
-----------

    REGION 1 :                SURFACE         AREA          REFLECTANCE
                              -------        ------         -----------
                                 1            1000              35 %

Overall building reflectance   35 %

-------------------------------------------------------------------------------


Unadjusted daylight obstruction  27.0 %

Reflectance adjusted daylight obstruction  27.0 %
```

```
                                                                    run code 208
```

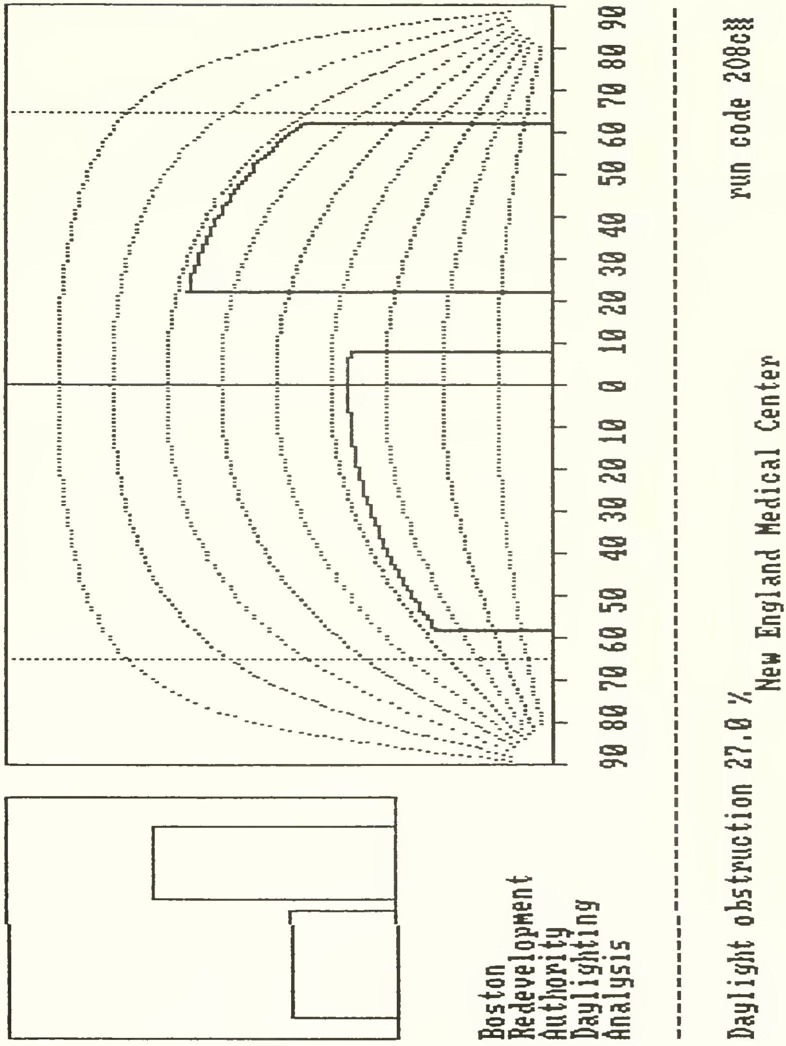


FIGURE 1. *Daylight Obstruction 27.0%* N.T.S.

```
PROJECT DATA
------- ----

PROJECT NAME :  New England Medical Center

BUILDING LOCATION :  Boston, Massachusetts

ARCHITECT / DEVELOPER :  NEMC

DATE :  23 March 1992

COMMENTS :  Washington Street Analysis


SITE CHARACTERISTICS
---- ---------------

Width of street :  88

Distance from street edge to front property line :  0

Width of property :  328


BUILDING CHARACTERISTICS
-------- ---------------

LAYER 1

     Distance back from front property line :  0

                                                 LAYER COORDINATES
          FROM          DIRECTION   DISTANCE   HORIZ(X)  VERT(Y)       IS NOW
     --------------     ---------   --------   ----------------     ------------
     left prop line       right          0          0        -            -
         ground            up            0          0        0        corner  1
        corner  1          up          150          0      150        corner  2
        corner  2         right        100        100      150        corner  3
        corner  3         down         150        100        0      end of layer

LAYER 2

     Distance back from layer 1 :  0

                                                 LAYER COORDINATES
          FROM          DIRECTION   DISTANCE   HORIZ(X)  VERT(Y)       IS NOW
     --------------     ---------   --------   ----------------     ------------
     left prop line       right        172        172        -            -
         ground            up            0        172        0        corner  1
        corner  1          up          150        172      150        corner  2
        corner  2         right        156        328      150        corner  3
        corner  3         down         150        328        0      end of layer


                                                                   run code 6I2u2
```

```
LAYER 3

     Distance back from layer 1 :  12

                                                     LAYER COORDINATES
          FROM          DIRECTION    DISTANCE    HORIZ(X)  VERT(Y)      IS NOW
     --------------   ---------    --------    -----------------    ------------
     left prop line     right          100        100        -           -
         ground          up              0        100         0       corner  1
        corner  1        up            120        100       120       corner  2
        corner  2       right           72        172       120       corner  3
        corner  3       down           120        172         0     end of layer


Reflectance
-----------

     REGION 1 :                 SURFACE           AREA           REFLECTANCE
                                -------          ------          -----------
                                   1              1000              35 %

Overall building reflectance    35 %

-------------------------------------------------------------------------------

Unadjusted daylight obstruction  46.2 %

Reflectance adjusted daylight obstruction  46.2 %




                                                                       run code 6I2u2
```

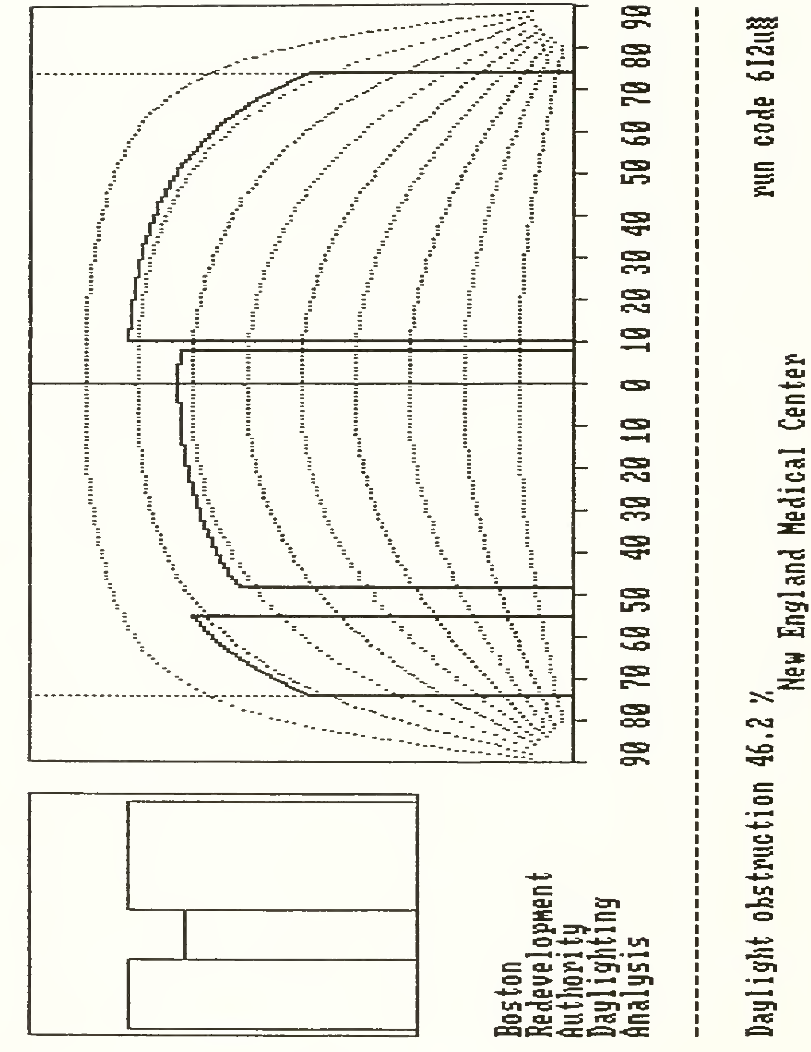


FIGURE 2. *Daylight Obstruction 46.2%* N.T.S.

```
PROJECT DATA
------- ----

PROJECT NAME :  New England Medical Center

BUILDING LOCATION :  Boston, Massachusetts

ARCHITECT / DEVELOPER :  NEMC

DATE :  30 January, 1992

COMMENTS :  Oak Street Analysis


SITE CHARACTERISTICS
---- ---------------

Width of street :  40

Distance from street edge to front property line :  0

Width of property :  90


BUILDING CHARACTERISTICS
-------- ---------------

LAYER 1

     Distance back from front property line :  0

                                                       LAYER COORDINATES
          FROM          DIRECTION   DISTANCE       HORIZ(X)   VERT(Y)          IS NOW
     --------------    ---------   --------       -----------------       ------------
     left prop line      right          0              0         -               -
         ground           up            0              0         0          corner   1
        corner   1        up          150              0       150          corner   2
        corner   2       right         90             90       150          corner   3
        corner   3       down         150             90         0        end of layer


Reflectance
-----------

     REGION 1 :                   SURFACE           AREA            REFLECTANCE
                                  -------          ------           -----------
                                     1              1000                35 %


                                                                   run code 7S6Q2
```

```
Overall building reflectance   35 %

-----------------------------------------------------------------------------

Unadjusted daylight obstruction  91.6 %

Reflectance adjusted daylight obstruction  91.6 %
```

```
                                                                    run code 7S6Q2
```

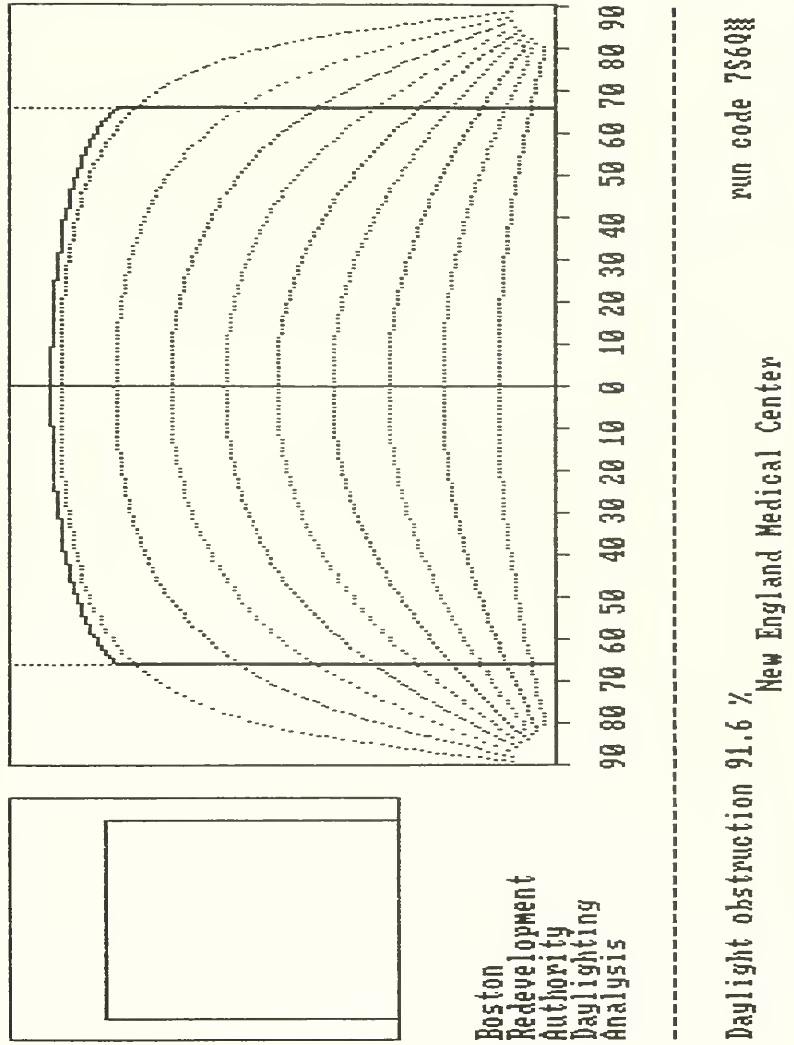
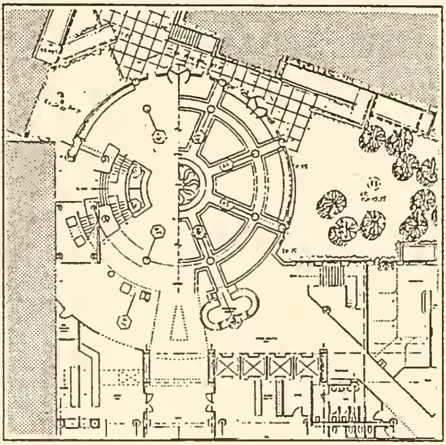


FIGURE 3. Daylight Obstruction 91.6% N.T.S.



Appendix G: Geotechnical

PHASE II - SCOPE OF WORK
NEW ENGLAND MEDICAL CENTER HOSPITAL
PARCEL 1-C
BOSTON, MASSACHUSETTS
DEP SITE NO. 3-3485

PREPARED FOR:
New England Medical Center Hospital
Boston, Massachusetts

PREPARED BY:
GZA GeoEnvironmental, Inc.
Newton Upper Falls, Massachusetts

February 1992
File No. 12648.2

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GZA
GeoEnvironmental, Inc.

Engineers and
Scientists

February 14, 1992
File No. 12648.2-C,PC
12648-C

Mr. Frederick R. Lynch
Director of Facilities
NEMC Real Estate, Inc.
100 Boylston Street, Suite 1025
Boston, Massachusetts 02116

320 Needham Street
Newton Upper Falls
Massachusetts 02164
617-969-0050
FAX 617-965-7769

Re: Phase II - Scope of Work
NEMCH Parcel 1-C
DEP Site No. 3-3485

Dear Mr. Lynch

Attached is a copy of our Phase II Scope of Work for the Parcel 1-C site in Boston, Massachusetts. This scope of work was prepared in accordance with our December 5, 1991 proposal. In accordance with the requirements of the Massachusetts Contingency Plan and Waiver of Approvals issued for the site by the Massachusetts Department of Environmental Protection (DEP), we will submit a copy of the Scope of Work to DEP prior to the start of Phase II activities.

Please call if you have any questions or need further information during your review.

Very truly yours,

GZA GEOENVIRONMENTAL, INC.

A Subsidiary of GZA
GeoEnvironmental
Technologies, Inc.

Mary B. Hall
Mary B. Hall
Project Manager

for James V. Errico
Associate Principal

MBH/JVE:mbh
Attachment: Scope of Work

cc: Robert Bland, NEMC

An Equal Opportunity Employer M/F/V/H

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APPENDIX B QUALITY ASSURANCE/QUALITY CONTROL PLAN

APPENDIX C HEALTH AND SAFETY PLAN

1.00 BACKGROUND

This Phase II - Scope of Work for the New England Medical Center Hospital (NEMCH) Parcel 1-C Site has been prepared by GZA GeoEnvironmental, Inc. (GZA) on behalf of New England Medical Center Hospital, the site owner. A Site Locus is included as Figure 1. This document is intended to comply with the requirements of 310 CMR 40.545, which outlines the purpose and scope of a Phase II - Comprehensive Site Assessment under the Massachusetts Contingency Plan (MCP).

HMM Associates, Inc. completed an environmental study of the NEMCH Parcel 1-C Site at 810-868 Washington Street in Boston, Massachusetts, documenting the results of their work in a report titled, "Hazardous Materials Site Assessment" dated November 5, 1990. HMM Associates also completed a Waiver of Approvals application, which was submitted to the Massachusetts Department of Environmental Protection (DEP) on December 6, 1990 along with the report, a Site Classification form and a Preliminary Assessment form as part of a Phase I study. A Waiver of Approvals was approved by DEP on February 8, 1991.

In summary, HMM's environmental study indicated that there were elevated levels of petroleum hydrocarbons (PHCs), and polynuclear aromatic hydrocarbons in some of the fill at the site. In addition, the level of lead in the fill at some locations appeared elevated. The contamination appears to be limited to the fill strata; which composes the top approximately 2 to 8 feet of the soil profile; and was not detected in the underlying clay.

Proposed development of the parcel consists of two seven to nine story towers. Ten to fifteen feet of soil will be excavated to provide one level of below grade parking. The new medical complex will be part of NEMCH.

2.00 OBJECTIVES

The MCP states that a Phase II - Scope of Work must include:

- a plan to fill in data gaps identified in Phase I and to perform the activities identified in 310 CMR 40.545(3) of the MCP (refer to Section 3.00 of this document);
- a schedule for implementation of the Phase II - Comprehensive Site Assessment (refer to Section 4.00);
- a sampling plan for all media and analytical protocols (refer to Appendix A);

- a quality assurance/quality control plan (refer to Appendix B); and

- a health and safety plan, including measures to safeguard nearby residents (refer to Appendix C).

These objectives are addressed in the following sections of this Scope of Work. It should also be noted that the Phase II - Scope of Work is subject to revision as further site information becomes available. Revisions will be documented in the Phase II - Report.

3.00 PHASE II - SCOPE OF WORK

The Phase II - Scope of Work for the NEMCH Parcel 1-C site includes the tasks outlined below. Procedures for field tasks are discussed in the Sampling and Analysis Plan and Standard Operating Procedures in Appendix A.

3.10 TASK 1 - TEST BORINGS AND MONITORING WELL INSTALLATIONS

Based on the results of the Phase I study, we will conduct six to eight test borings at the site. Shallow overburden wells will be installed in two of the wells. Tentative locations for these borings and wells are shown on the attached Figure 2. Actual locations will be selected in the field based on accessibility and on field reconnaissance data.

Test borings will be advanced using hollow stem augers without the use of drill water. Soil samples will be collected continuously in the fill and at 5-foot intervals thereafter using standard split spoon sampling techniques. Except for the two borings with monitoring wells, the test borings will be terminated 2 to 5 feet into the clay stratum below the fill. The borings with monitoring wells will be terminated at least 5 feet below the groundwater table. Wells will consist of 2-inch-diameter PVC set in silica sand filter packs with bentonite seals. Locking steel protective casings or flushed-mounted curb boxes will be used to complete each well.

3.20 TASK 2 - SOIL ANALYSES

Chemical analyses of fill samples from the site will be the main thrust of the analytical program since the initial HMM study indicated elevated levels of total petroleum hydrocarbons (TPHs), polyaromatic hydrocarbons (PAHs), and some metals in the fill at the site. Limited volatile organic compound (VOC) screening will also be performed to confirm HMM's results. The additional testing will provide data for the environmental risk assessment.

Soil samples will be screened in the field and the laboratory for VOCs using an H-Nu photoionization detector. Based on these results, two soil samples will be analyzed for VOCs using EPA Method 8240. Ten to fifteen soil samples will be screened for TPH and PAHs in GZA's Environmental Chemistry Laboratory (ECL) using a gas-chromatograph fingerprint method (Modified ASTM Method D3328-78). Two to three duplicate samples and one to two other samples will be analyzed for PAHs using EPA Method 8270 to confirm the screening results. The samples for PAH and TPH screening and/or analyses will be selected mainly on appearance.

In addition, four soil samples will be submitted for total metals analyses (RCRA 8 metals).

3.30 TASK 3 - WELL SAMPLING AND ANALYSES

Newly installed wells will be purged, developed and surveyed to a common datum. We will then measure water levels in both previously existing and new wells to develop a groundwater contour plan.

Water samples from each new well will be analyzed for pH and specific conductance and screened for VOCs. A sample from one new well will be analyzed for VOCs by EPA Method 8240. Note that only one groundwater sample is being evaluated for VOCs since the previous environmental work at the site did not indicate the presence of VOCs in groundwater. Samples from two monitoring wells will also be analyzed for PAHs using EPA Method 8270.

3.40 TASK 4 - HEALTH RISK ASSESSMENT

We will complete a public health and environmental risk characterization as part of the Phase II work. This characterization will evaluate the level of human health and ecological risk potentially associated with exposure to chemical contaminants present at and possibly migrating from the site. The chemical contaminates to be addressed include TPHs, PAHs, and, to a lesser extent, metals. The source media of concern are soil and groundwater.

Exposures to groundwater and soil under both current and reasonably foreseeable future uses of the site will be considered. Anticipated potential exposure pathways include:

- direct contact with incidental ingestion of contaminated soils by on-site workers and site trespassers during excavations associated with construction;

- direct contact with contaminated groundwater by on-site workers and by site trespassers; and

- inhalation of contaminants released from fugitive dust generated during site construction activities by on-site workers and by site trespassers.

We will complete the risk characterization in accordance with the requirements for Phase II assessment under the MCP as outlined in 310 CMR 40.545(g) and (h) and DEP guidance for meeting the requirements.[1] The guidance is presently limited to the public health component and does not address environmental risk characterization. However, the U.S. EPA has published guidance which we will generally follow for this evaluation.

3.50 TASK 5 - REPORT DEVELOPMENT

We will prepare a Phase II - Report upon completion of field and analytical work. This report will include a summary of previous studies, a discussion of investigation procedures, characterization of hydrogeologic conditions, and an evaluation of the distribution of site-related contamination. Graphical presentations of site data including a subsurface profile and groundwater contour plan will be incorporated into the report as appropriate. Supporting data (exploration logs, chemical testing results, etc.) will be attached as Appendices to the report.

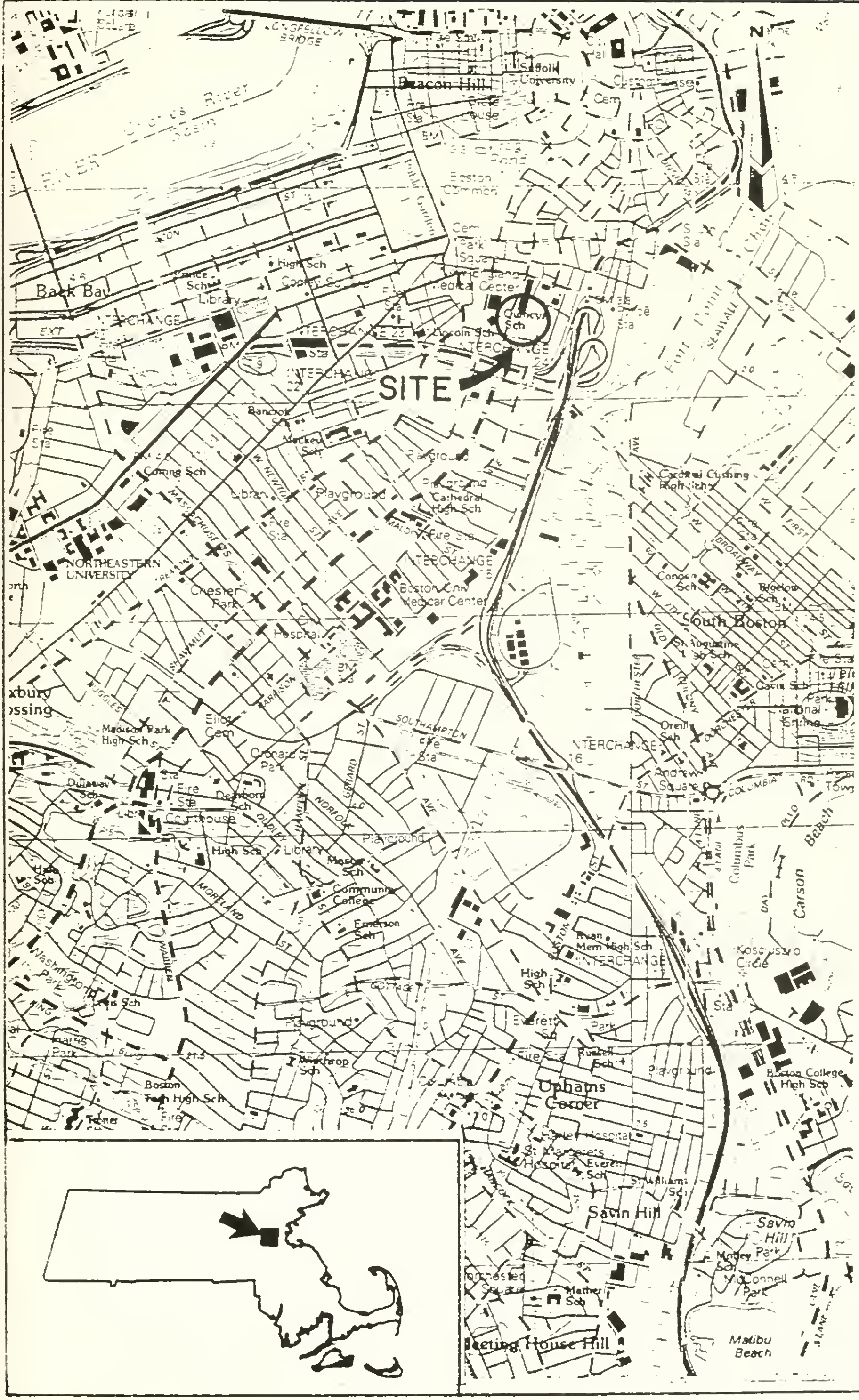
4.00 SCHEDULE

We anticipate beginning fieldwork on the Phase II study in the beginning of February 1992. For the Scope of Work outlined above, we anticipate approximately eight to ten weeks would be required from the start of field work to completion of the final report.

---

[1] DEP, 1989 Guidance for Disposal Site Risk Characterization and Related Phase II Activities - In Support of the Massachusetts Contingency Plan. Office of Research and Standards, May 17, 1989.

FIGURES



DRAWN BY: L.READY
SCALE: 1: 25000
DATE: SEPT. 1991

DESIGNED BY: S.N.
CHECKED BY: M H.
REVIEWED BY: M H

GZA
GeoEnvironmental, Inc.

GRAPHIC SCALE

0' 1000' 2000' 4000'

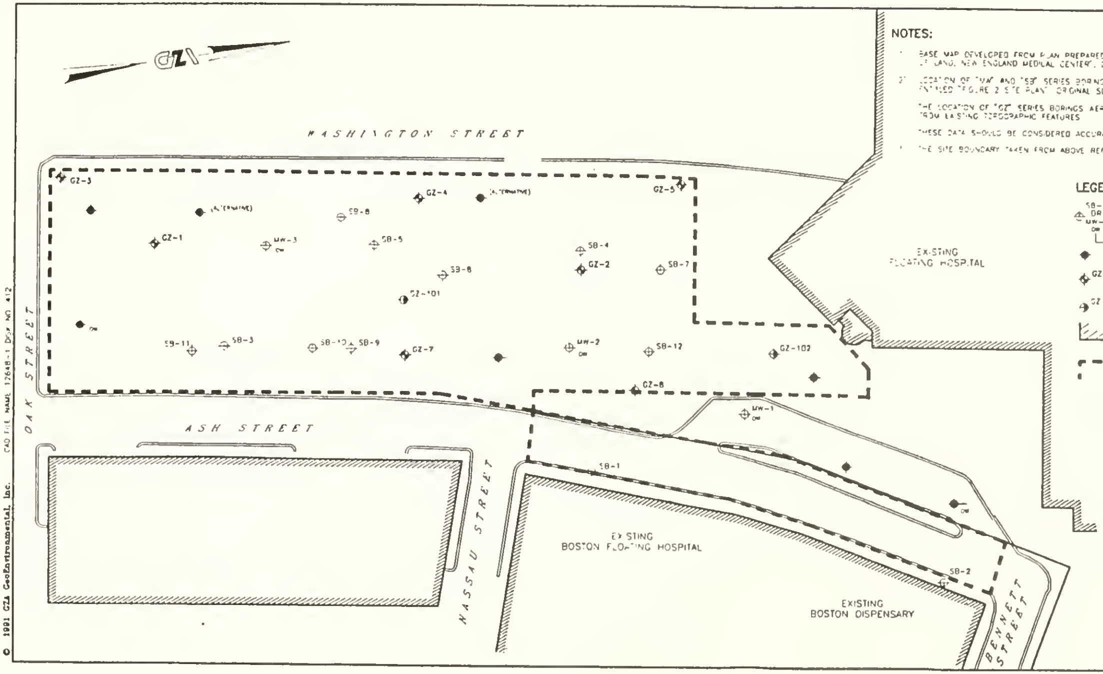
SOURCE: U.S.G.S. BOSTON SOUTH, MASS QUADRANGLE MAP 1987

NEW ENGLAND MEDICAL CENTER HOSPITAL
BOSTON, MASS.

LOCUS PLAN

PROJECT NO.
12648

FIGURE No.
1



NOTES:

1. BASE MAP DEVELOPED FROM PLAN PREPARED BY HARRY R. FELDMAN, INC. TITLED TOPOGRAPHIC PLAN OF LAND, NEW ENGLAND MEDICAL CENTER", DATED OCT. 17, 1991

2. LOCATION OF "MW" AND "SB" SERIES BORINGS ARE BASED ON PLAN PREPARED BY HMM ASSOCIATES INC ENTITLED "FIGURE 2 SITE PLAN" ORIGINAL SCALE 1"=70'

3. THE LOCATION OF "GZ" SERIES BORINGS WERE APPROXIMATELY DETERMINED BY TAPE MEASUREMENTS FROM EXISTING TOPOGRAPHIC FEATURES

4. THESE DATA SHOULD BE CONSIDERED ACCURATE ONLY TO THE DEGREE IMPLIED BY THE METHOD USED

5. THE SITE BOUNDARY TAKEN FROM ABOVE REFERENCED PLAN BY HMM ASSOCIATES, INC

LEGEND:

⊕ SB-1 DR / MW-1 OW	BORINGS PERFORMED BY A. SHINER TEST BORINGS, INC. UNDER THE DIRECTION OF HMM ASSOCIATES, INC. FROM 8/29/90 TO 8/30/90
└	INDICATES OBSERVATION WELL
◆	PROPOSED BORING LOCATION
⊕ GZ-1	GEOTECHNICAL BORINGS PERFORMED BY GZA DRILLING, INC. FROM 8/28/91 TO 9/10/91
◐ GZ-101	GEOTECHNICAL BORINGS PERFORMED BY GZA DRILLING, INC. FROM 12/2/91 TO 12/5/91
▨	EXISTING BUILDING
┌ ‒ ‒	SITE BOUNDARIES PARCEL I-C

REV NO	DESCRIPTION	BY	DATE

SCALE IN FEET
0' 15' 30' 60'

PROJ. MGR. M.H.
CHECKED BY: M.H.
REVIEWED BY: M.H.

DRAWN BY: L.READY
SCALE: 1"=30'
DATE: JAN.,1992

GZA

NEMCH PARCEL I-C
PHASE II SCOPE OF WORK

BOSTON, MASS.

EXPLORATION LOCATION PLAN

PROJECT No. 12648.2

FIGURE No. 2

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CAD FILE NAME 12648-1 DSK NO. 412

APPENDIX A

SAMPLING AND ANALYSIS PLAN

PHASE II
COMPREHENSIVE SITE ASSESSMENT
NEMCH PARCEL 1-C
BOSTON, MASSACHUSETTS
DEP SITE NO. 3-3485

PREPARED FOR:
New England Medical Center Hospital
Boston, Massachusetts

PREPARED BY:
GZA GeoEnvironmental, Inc.
Newton Upper Falls, Massachusetts

February 1992
File No. 12648.2

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3.20 SAMPLE LABELLING, CUSTODY AND TRANSPORT 3

4.00 ANALYTICAL PROTOCOLS 4

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4.20 WATER SAMPLES 4

ATTACHMENT I GZA STANDARD OPERATING PROCEDURES

ATTACHMENT II GZA ENVIRONMENTAL CHEMISTRY LABORATORY - ANALYTICAL PROTOCOLS

1.00 INTRODUCTION

1.10 PROJECT DESCRIPTION

This project consists of a Phase II - Comprehensive Site Assessment of the New England Medical Center (NEMCH) Parcel 1-C site in Boston, Massachusetts. The study is designed to meet the specific requirements of the Massachusetts Contingency Plan as outlined in 310 CMR 40.545. Further description of the site and project background information are provided in Section 1.00 of the Phase II - Scope of Work.

1.20 SAMPLING PROGRAM OBJECTIVES

The general objectives of the field investigation program for the Phase II study will be to characterize the nature and extent of oil or hazardous materials at the NEMCH Parcel 1-C site and provide data necessary to evaluate remedial response alternatives. The primary focus of the field study will be on soil and groundwater conditions. No surface water bodies are present on the site and available information does not indicate significant potential for air emissions; accordingly, these media will not be included in the sampling program. Soil gas sampling results will provide a preliminary assessment of possible volatile organic compound (VOC) emissions. Based on the results of this sampling, further assessment of air emissions may be recommended, if deemed appropriate.

2.00 SAMPLING PROCEDURES

2.10 DRILLING AND SOIL SAMPLING

Test borings will be drilled at the locations indicated on Figure 2, or at alternate sites to be selected in the field. Six to ten borings, two of which will be completed as shallow monitoring wells, will be drilled using dry hollow stem auger techniques, in accordance with GZA SOP 1.1.1 (see Attachment I to this appendix). Borings will be advanced up to 5 feet into the clay stratum below the fill, except for the borings with wells which may go deeper to encounter groundwater.

Split spoon soil samples will be obtained by Standard Penetration Tests (ASTM Method D1586-67) continuously in the fill and at 5-foot intervals or at observed strata changes in accordance with SOP 3.1.7.2 (see Attachment I to this appendix). A portion of each sample will be collected in clean 8-ounce glass jars and stored for subsequent VOC, TPH, PAH, and/or metals analyses or screening.

Wells consisting of 5 or 10 feet of slotted (0.01 inch), 2-inch-diameter PVC pipe attached to solid PVC riser will be installed in two borings. Overburden wells will be installed in accordance with GZA SOP 2.1 (see Attachment I). All PVC connections will be by flush threaded joints without the use of solvents or glues. A filter of clean silica sand will be placed in the annular space around the well screen and a bentonite clay seal will be installed above this filter sand. Wells will be completed with a locking steel protective casing or road box. Locations of the well screens within the borings will be selected in the field by GZA personnel based on observed stratigraphy and field testing results.

2.20 GROUNDWATER SAMPLING

We will collect groundwater samples from newly installed wells using stainless steel bailers with Teflon ball-check valves (see GZA SOP 3.1.2 in Attachment I). A separate, laboratory-cleaned bailer will be used for each well to minimize the potential for cross contamination. Either separate bailer cables will be employed for each well or cables will be decontaminated between wells. At least three times the initial standing volume of the groundwater in the well will be evacuated prior to sample collection. Water samples will be transferred from bailers to the appropriate containers, as outlined in Section 3.10.

2.30 WATER LEVEL MEASUREMENTS

We will measure water levels in the monitoring wells at the site using an electric water level reader. Measurements will be made from the highest point of the well casing; the distance between the well casing and ground surface elevation will also be recorded. Well casing elevations will be established by standard optical survey procedures referenced to an on-site datum.

3.00 SAMPLE HANDLING

3.10 SAMPLE CONTAINERS AND PRESERVATION

Containers employed for samples destined for laboratory analyses will be obtained from the analytical laboratory or from a commercial supplier of pre-cleaned containers (e.g., I-CHEM Research Corporation). Container cleaning and preparation will be in accordance with relevant EPA protocols for the proposed analyses. For the work outlined in this plan, sample containers and preservation are summarized below.

Medium	Analytical Parameter	Container	Preservation
I. Soils	PID Screening	250 ml glass	None (cool)
	VOCs (Method 8240)	2 - 40 ml glass septum vials	None (cool)
	PAHs (Method 8270)	500 ml glass	None (cool)
	Petroleum hydrocarbons	500 ml glass	None (cool)
	Metals (RCRA-8)	500 ml polyethylene or glass	None
II. Water	VOCs (Method 8240)	3 - 40 ml glass septum vials	HCl to pH <2
	PAHs (Method 8270)	1 liter glass	None (cool)

3.20 SAMPLE LABELLING, CUSTODY AND TRANSPORT

Each sample container will have a permanently attached label with spaces for the following information:

- Project Number
- Sample Number
- Date
- Sampler's Initials
- Preservative

All entries on the sample label will be made with permanent waterproof markers. A chain-of-custody sheet will be completed for each group of samples in accordance with GZA SOP 3.2.3 (see Attachment I) and the QA/QC plan (Appendix B).

After sample collection, containers will be placed in a cooler with ice or synthetic ice packs and appropriate packing material (vermiculite, etc.). The chain-of-custody form will accompany the samples during transport. Samples will be delivered to the analytical laboratory or to GZA's Environmental Chemistry Laboratory (ECL) within 24 hours of collection.

4.00 ANALYTICAL PROTOCOLS

4.10 SOIL SAMPLES

Soil samples collected during the test boring program (Section 2.30 above) will be screened for VOCs using the PID according to GZA SOP 4.1.2 (see Attachment I). Based on these results, two samples will be submitted for VOC analysis using Method 8240. Selected soil samples will be screened in GZA's ECL for TPH and PAH's using the protocol included in Attachment II to this appendix. Two to three duplicate samples will be analyzed for PAH's using Method 8270 to provide a quality control check on screening results.

In addition, four selected soil samples will be analyzed for total metals in a Massachusetts Certified Laboratory according to the following protocols:

PARAMETER	ANALYTICAL METHOD (EPA No.)
I. INORGANIC COMPOUNDS	
Arsenic (As)	200.7/206.2
Barium (Ba)	200.7
Cadmium (Cd)	200.7/213.2
Chromium (Cr)	200.7
Lead (Pb)	200.7/239.2
Mercury (Hg)	245.1
Selenium (Se)	200.7/270.2
Silver (Ag)	200.7

4.20 WATER SAMPLES

Groundwater samples collected from the two newly installed wells will be analyzed for pH and specific conductance in GZA's ECL. One sample will be analyzed for VOCs using EPA Method 8240.

Samples from two monitoring wells to be selected for PAH analysis using EPA Method 8270.

ATTACHMENT I

GZA STANDARD OPERATING PROCEDURES

GZA STANDARD OPERATING PROCEDURES

SECTION 1.0 SUBSURFACE EXPLORATIONS

- 1.1 OVERBURDEN BORING
  - 1.1.1 Machine Operated Hollow Stem Augering Boring

SECTION 2.0 WELL INSTALLATIONS

- 2.1 OVERBURDEN WELLS

SECTION 3.0 SAMPLING PROCEDURES

- 3.1 SAMPLE COLLECTION
  - 3.1.2 Monitoring Wells
  - 3.1.7 Soil
    - 3.1.7.2 Subsurface Soil
- 3.2 SAMPLE HANDLING
  - 3.2.3 Chain-of-Custody Record Keeping

SECTION 4.0 FIELD MONITORING AND TESTING

- 4.1 FIELD INSTRUMENTS
  - 4.1.2 Photoionization Detector (HNu Model PI-101)
  - 4.1.5 pH Meter
  - 4.1.8 Conductivity Meter

OVERBURDEN "MACHINE OPERATED HOLLOW STEM AUGERING" BORING

SOP NO. 1.1.1

1. Purpose

To establish standard operating procedures for the advancing of shallow earth borings employing the hollow stem auger method for geotechnical explorations and hazardous waste site investigations.

2. Equipment and Materials

The driller shall be capable of providing power-driven sectional hollow stem auger flights with a minimum inside diameter of 3-3/4 inches. In addition, the following equipment shall be present:

- Drill rods, minimum size equivalent to the "A" rod, (1-5/8 inch O.D. and 1-1/8 inch I.D.)
- Hollow stem auger plug
- Drive hammer (1) 300 pound and (1) 140 pound ± 5 pounds
- 2-inch O.D. split spoon sampler
- Roller bit and diamond corer bit
- Water tank and pump

3. Procedures

The boring is advanced by rotating a single section of hollow stem auger into the soil to desired depth or the limit of the auger section. To continue advancing the borehole, additional auger flights are added one at a time and this sequence is repeated until the required depth is reached. When an obstruction is met, the driller may be required to attempt to penetrate the obstruction by the use of a roller bit or by coring. If attempts to penetrate obstruction are unsuccessful, boring will be abandoned.

Hollow stem auger techniques should be employed without the use of drilling water while drilling on hazardous waste sites.

SOP 1.1.1 OVERBURDEN "MACHINE OPERATED HOLLOW STEM AUGERING" BORING (Continued)

If water is deemed necessary by driller, its use must be approved by the drilling inspector. Drilling water quality should be evaluated by collecting samples for appropriate analyses. When water is used to advance boring, it must not be recirculated back into the boring, unless specifically authorized by the drilling inspector.

The auger plug must be in place at the auger head while borehole is being advanced to prevent soil from being transported through auger.

4. Records and Documentation

The details of the boring shall be recorded on the GZA boring log (copy attached).

5. Special Notes

Whenever standard operating procedures are varied, it shall be recorded. The drilling inspector should also record any detected odor from boring, and depth encountered.

Hollow stem auger borings often provide the simplest method of soil investigation and sampling. However, depths of auger investigations are limited by groundwater conditions, soil characteristics, and the equipment used.

6. Applicable Standards and References

ASTM D1452-80 Soil Investigation and Sampling by Auger Borings

WELL INSTALLATIONS - OVERBURDEN WELLS

SOP NO. 2.1

1. Purpose

Overburden (unconsolidated formation) wells are installed to provide access to groundwater for sampling purposes, determination of groundwater elevation, and to monitor fluctuations in groundwater elevation.

2. Equipment and Materials

- Schedule 40 PVC pipe, 1-1/2- or 2-inch diameter, flush-joint threaded
- Schedule 40 PVC slotted wellscreen, 1-1/2- or 2-inch diameter, 0.01-inch slots, flush-joint threaded
- Bentonite clay (pellets and powder)
- Clean silica sand
- Portland cement
- Concrete mix
- Steel pipe, 3-inch or 4-inch diameter, 5-foot length, threaded one end, with cap and locking device
- Valve gate box

3. Procedures

A. Install an Ottawa sand filter below the proposed base of the wellscreen approximately one foot (1') thick by pouring sand down the borehole while withdrawing the casing one foot (1'). Measure and record the depth of the sand cushion.

B. Assemble and install the observation well pipe and screen. Well tip must be fitted with a threaded or slip-on plug. All pipe sections shall be connected by dry threading of the joints. No glue, solvents, or lubricating compounds shall be used to make up the connections. The well pipe assembly must be carefully lowered into the borehole to ensure centering of the well in the hole. After installation, the GZA field engineer and the drilling contractor will carefully measure the depth to the well tip and record the measurement on the well log.

SOP 2.1 WELL INSTALLATIONS - OVERBURDEN WELLS (Continued)

C. Install a sand filter around the wellscreen to at least two feet (2') above the screen. Grain size of the sand shall be appropriate for the slot size of the screen (normally 0.01 inch).

D. Withdraw the casing to the top of the sand pack and install a bentonite clay seal approximately two feet (2') thick above the sand filter.

E. Insert a tremie pipe to just above the top of the bentonite seal and backfill the remainder of the hole with grout until it flows at the surface. (Grout should consist of cement-bentonite, high solids bentonite, or expansive cement mixtures to be selected by the drilling inspector.)

F. Square cut the well pipe approximately 2 feet above grade.

G. Install a 5-foot section of steel pipe (3-inch or 4-inch diameter) equipped with a threaded, lockable cap, 3 feet into the borehole. Complete the installation by constructing a concrete surface pad around the steel guard pipe. The concrete pad shall be a minimum of 0.5 feet deep and 1.5 feet in diameter, sloped away from the protective casing.

H. If well head completions must be flush with the ground surface, a street box or lockable valve gate box may be installed in lieu of the metal pipe. Installation consists of square-cutting the riser pipe two inches (2") below grade and cement grouting the box in place.

4. Records and Documentation

Well installations will be recorded on the drilling log for the hole. Installation details to be recorded include total well depth, screen depth and length, filter and seal depths and thicknesses, well head completion type, and any other details or measurements deemed necessary by the field engineer. All measurements should be made from ground surface.

5. Special Notes

A. Steel protective pipe or valve gate boxes shall be steam cleaned or hot water power rinsed prior to installation to remove cutting oil or other residue. To assist in removal for sampling, the cap threads may be lubricated with a small amount of non-petroleum based material (e.g., vegetable oil).

B. If well is to be installed above the base of the borehole, care must be taken to ensure any underlying strata are properly sealed to preclude the possibility of cross contamination. Seals can be constructed using either grout or bentonite pellets.

C. Grout backfill above bentonite seal may be omitted under certain stratigraphic conditions. In those cases, hole should be backfilled with native materials with occasional thin bentonite seals. Completed installation must have a vertical permeability less than that of the natural strata encountered.

6. Applicable Standards and References

U.S. Environmental Protection Agency, "Procedures Manual for Ground Water Monitoring at Solid Waste Disposal Facilities," SW-611, December 1980.

SAMPLE COLLECTION - MONITORING WELLS

SOP NO. 3.1.2

1. Purpose

To obtain liquid samples for analysis to determine general quality of the groundwater at the sampling location or as part of a program to define a contaminant plume.

2. Equipment and Materials

- Appropriate sample containers
- Laboratory-cleaned stainless steel bailers
- Sampling cable
- 100-foot steel tape with weighted end
- Rags or paper towels
- Cooler and ice

Additional equipment and materials such as field screening equipment, filtering equipment, etc., may be needed for particular sampling rounds.

3. Procedures

A. Measure depth to groundwater to the nearest 0.01 foot using 100-foot tape or electric water level indicator.

B. Prior to sample collection, three times the volume of standing water in the well will be removed using the following method:

1) Measure depth to groundwater to the nearest 0.01 foot from the top of the riser pipe using the 100-foot steel tape.

2) If reliable information on well construction is not available, measure total well depth to the nearest 0.1 foot from the top of the riser pipe using the 100-foot steel tape.

3) Calculate the volume of standing water in the well using the above measurements and the inside diameter of the well.

SOP 3.1.2 SAMPLE COLLECTION - MONITORING WELLS (Continued)

4) Using a laboratory-cleaned stainless steel bailer of known volume, bail three times the volume of water calculated in (3) from the well.

5) Allow sufficient time for well to recharge before initiating sampling.

6) At locations where the well is deep, static water level is within 25 feet of top of casing, and recharge is sufficiently rapid to prevent drawdown below 25 feet, the calculated volume may be evacuated with the assistance of a portable centrifugal pump.

   a. To accommodate this process, each well to be pumped will be equipped with a dedicated 3/4-inch polyethylene tubing of appropriate length. The tubing may be stored in the well, hung from a clip to accommodate easy retrieval, or it may be removed, labelled, and stored for the next sampling round.

   b. After attachment, the pump is started. It is then calibrated using a vessel of known volume and a watch second hand.

   c. After completion of the required volume evacuation, with the pump still running, the suction line is removed from the well and coiled and the required samples are collected with clean stainless steel bailers.

7. Where required purge volumes are large and centrifugal pumping is not feasible, alternate purging methods such as peristaltic, inertial, gas-driven or bladder pumps may be used.

C. Using a clean stainless steel bailer, withdraw a sample from the well.

D. Transfer the sample from the bailer directly into the sample container by pouring the liquid down the side of the container with minimum turbulence. This procedure is critical to minimize loss of volatile materials from the sample through aeration.

E. Cap and seal the sample container.

F. Wipe down the bailer with clean rags or paper towels to dry it and store the bailer in a plastic bag separate from any stock of clean bailers.

G. Label, preserve, and store the sample in accordance with appropriate protocols.

4. Records and Documentation

All data and sampling information will be recorded in accordance with SOP No. 3.2.3.

5. Special Notes

A. Separate laboratory-cleaned bailers will be used for each well sampled to preclude cross-contamination. As an alternative, dedicated bailers or bladder pumps which are left in the individual wells may be employed.

B. Either separate bailer cables will be employed or cables will be decontaminated between samples using a methanol wash followed by a distilled water rinse.

C. Purging equipment should be either dedicated or disposable and constructed of materials which will not influence sample quality. If purging or sampling equipment is to be reused, appropriate decontamination procedures must be used. Equipment or decontamination blanks should be collected between monitoring wells as required by the project QA/QC requirements.

6. Applicable References and Standards

Dunlap, N.J.; McNabb, J.F.; Scalf, M.R.; and Crosby, R.L., "Sampling for Organic Chemicals and Microorganisms in the Subsurface," EPA-600/2-77-16, August 1977.

SAMPLE COLLECTION - SUBSURFACE SOIL

SOP NO. 3.1.7.2

1. Purpose

Subsurface soil samples are collected to determine the physical characteristics or levels of contamination of overburden material at any desired depth.

2. Equipment and Materials

- Appropriate sample containers
- Split-spoon sampler with appropriate drill rods
- Drill rig with 140 pound drive weight
- Stainless steel laboratory spoons
- Clean rags or terry cloths

3. Procedures

A. After boring and clean-out of the hole to the desired sampling depth, assemble the sampler and lower it carefully to the bottom of the hole.

B. With the split spoon sampler set at the bottom of the hole (be sure sampler is at the bottom of the casing), the drill rod should be marked at three consecutive 6-inch intervals for measuring the blows per 6 inches of driving. If the sampler is above the bottom of the casing, this indicates that the bottom has been disturbed and soil has risen up the casing. Do not attempt to sample. Withdraw the sampler and clean the hole. If soil has blown up the casing, the casing should be advanced to below the disturbed soil. Clean-out alone is not sufficient. Follow the instructions in Step F of this section.

C. The sampler should be driven by a 140-pound weight falling freely 30 inches. Check to make sure that the fall is 30 inches by marking the drive head and that the hammer is falling freely. The driller should use no more than two wraps of the rope around the cathead. Be certain that the rope is fully released to permit complete free fall of the hammer. The number of blows to drive each 6-inch interval should be recorded. The sampler should be driven at least 18 inches, unless the blow count exceeds 100 blows per 6 inches or unless refusal, as defined in the specification, is met. When the blow count exceeds 100 blows per 6 inches, the driving may be stopped and the sampler removed. The number of blows and the inches penetrated should be recorded. After driving in dense soils, the drill rods may have to be turned clockwise to free the sampler for removal. Turning counterclockwise will only loosen the joints, and you may lose the sampler in the hole. Bumping up the rods should be avoided, if possible, because it tends to reduce the amount of soil recovery. However, it is sometimes necessary in very dense soils in order to free the sampler.

D. In most cases, but especially when sampling in sands and loose silts, the driller should keep the casing full of water at all times. This will require adding water while the rods are being withdrawn prior to sampling and when sampler is withdrawn. If this measure is not sufficient to prevent soil from running up into the casing, then commercial drilling mud should be used. Use a perforated section of drill rod above the sampler to facilitate drainage of drill fluid after sampling. When sampling soils for chemical testing, however, no water should be used so that the geochemical integrity of the sample is preserved.

E. When the sampler is brought to the ground surface, it should be opened immediately, and the length of recovery should be measured and recorded. Any loose wash at the top of the sample should not be counted as part of the recovery. If recovery is less than 6 inches, another sample should be taken immediately below this sample, except in certain instances, such as where rock is encountered and coring is necessary.

F. If recovery is insufficient, put sampler back down hole and proceed as follows: if original depth is reached, drive sampler 18 inches and record blows as new sample; if original depth is not reached, redrive sampler to recover disturbed material record only original blow count and that sample recorded or redrive.

G. Remove sample with a clean laboratory spoon and transfer it directly to a suitable sample container.

SOP 3.1.7.2 SAMPLE COLLECTION - SUBSURFACE SOIL (Continued)

H. Label, preserve, and store the sample in accordance with the Quality Assurance Project Plan.

I. Wash the split spoon with water and rinse with reagent grade methanol followed by distilled water.

4. Records and Documentation

A. All sampling information will be recorded as specified in the Quality Assurance Project Plan.

B. penetration resistance will be recorded on standard boring log forms, pages 1 and 2.

5. Special Notes

None

6. Applicable Standards and References

ASTM D1586-67

CHAIN-OF-CUSTODY RECORD KEEPING

SOP NO. 3.2.3

1. Purpose

A chain-of-custody record is kept to provide documentation linking the collection of a sample to the performance of a laboratory test on that sample. That documentation includes: the name of the sample collector, the type of sample, the location of the sampling, the date and time of the sampling, and the names of the individuals who transported the sample from the field to the laboratory.

2. Equipment

GZA or other project approved chain-of-custody record form.

3. Performance

A. Review the project work plan and the project contract for specific chain-of-custody record keeping requirements. Requirements detailed in either the project work plan or the project contract take priority over the instructions detailed below.

B. The chain-of-custody form is shipped inside the transporting container. If the samples are shipped by public courier (if Federal Express, UPS, etc.) the airbill generally serves as the chain-of-custody record for that portion of the trip.

C. The field drilling log generally serves as the chain-of-custody record for transportation of split spoon samples from the field to GZA's laboratory. A separate chain-of-custody record form must be used to transport soil samples to outside laboratories.

D. The intent is to use one (more as required) GZA chain-of-custody record form per day.

E. In general, one line on GZA's chain-of-custody form can suffice for each station number. When more than one sample is collected at a station, use the following:

Time - Provide the time the sampling was completed at that station.

Container ID - For this situation this column is non-applicable and should be so indicated (i.e., NA).

Sampler ID - If more than one sampling tool is used, indicate the number used and describe each on the record notes.

Note that project QA/QC procedure may require that each sample container be tracked. This will necessitate the use of a separate line for each container.

F. Prior to leaving the site, verify that all pertinent data is on the chain-of-custody form.

4. Records and Documentation

A. The white original is forwarded to the laboratory. That copy should be returned to GZA with the laboratory results.

B. The yellow copy is retained by the collector. That copy is to become part of that day's field records.

C. The pink copy is returned to the Project Manager for inclusion in project files.

5. Special Notes

None

6. Applicable References and Standards

GZA chain-of-custody record form.

SOP 3.2.3 CHAIN-OF-CUSTODY RECORD KEEPING (Continued)

(Chain-of-custody form)

FIELD MONITORING - PHOTOIONIZATION DETECTOR (HNu MODEL PI-101)

SOP NO. 4.1.2

1. Purpose

To provide operating procedures for the HNu Systems Model PI-101 photoionization detector for field surveying of organic vapors.

2. Equipment and Materials

HNu Systems Model PI-101 Photoionization Detector, including readout assembly, probe assembly and extension, and battery charger.

3. Procedures

A. Preparation for Use

1) Assemble the photoionization probe by screwing the handle to the probe body and inserting the probe extension into the probe body.

2) Connect the probe to the meter by matching the alignment keys on the 12-pin connector, pressing down, and twisting the connector lock until a distinct snap is felt.

3) Turn the function switch to the battery check position. The needle should swing into the green arc on the scaleplate. If it does not, the unit must be recharged before use.

4) Turn the function switch to the standby position and rotate the zero potentiometer until the meter reads zero. At this setting, the probe fan should turn on. (A distinct hum indicates operation of the fan.)

5) Turn the function switch to the 0-20 ppm scale setting. The UV light source should be on at this setting, indicated by a faint purple glow in the probe tip.

SOP 4.1.2 FIELD MONITORING - PHOTOIONIZATION DETECTOR (HNu MODEL PI-101) (Continued)

B. Calibration

Calibrate instrument in accordance with manufacturer's specifications. (Instruction Manual, 1985, Section 3).

C. Operation - Air Quality Monitoring

1. The probe should be held in close proximity to the area being monitored to provide a representative reading. The lowest possible scale range should also be selected. In environments where levels of volatile organics are unknown, initially use the 0-20 ppm scale and then change to higher scales, if appropriate.

2. Do not allow the probe intake to directly contact soil or liquid materials. This will disrupt the air flow to the UV light source and may contaminate the probe.

3) After completion of monitoring, the meter should be turned off, cleaned, and repacked. Operating time should be recorded on the battery usage log.

D. Operation - Soil Sample Screening for Volatiles

1) Collect soil samples immediately after exposure to the surface during exploration activities.

   a) Split spoon samples -- Remove spoon from the borehole and detach from the drill string. Immediately dry off the spoon so that external water/drilling fluid (if used) does not contact sample. Open spoon and transfer the sample to the sample bottle as quickly as possible to limit loss of VOCs.

   b) Other samples -- For test pits, hand auger holes or other sampling, transfer soils to sample containers immediately after collection.

2) Fill the driller's jar to between 1/2 and 2/3's of its 8-ounce volume. Do not overfill; airspace is needed.

3) These samples may be screened in the field or brought back to the office to be tested under laboratory conditions. Samples should be kept cool and away from direct light if laboratory screening is selected.

4a) To obtain a sample of the headspace above the soil, pierce the metal lid with a punch and withdraw 30 cc with a glass syringe. Do not take the entire lid off. Seal the hole with Teflon tape and non-volatile white marking tape.

4b) Where less rigorous screening techniques are required, the soil headspace can be sampled by unscrewing the jar cover and inserting the probe tip into the small opening under the cap. This technique results in greater exposure of the sample to ambient air with a resultant decrease in sensitivity but eliminates the need for syringes and resealing punch holes.

5) For method 4a, quickly insert the 30 cc headspace sample into the HNu probe.

6) Record the maximum meter response on the boring log or data sheet. (Note: The meter may deflect negatively only; record this as "N" or "NEG", do not record as "No Reading").

7) If the reading is greater than 20 ppm, another higher range is selected. However, the sample should be shaken up and allowed to re-equilibrate before another syringe extraction is obtained.

8) If a significant result is recorded (i.e. >2.0 ppm), inject a blank of ambient air into the probe to ensure that the syringe is not contaminated for the next injection by carry over.

9) For reproducible results, this type of screening is best performed under laboratory conditions.

10) The accuracy of the above syringe injection procedure can be checked for a specific VOC by filling the syringe with an appropriate calibration gas of known concentration. With the span control set for the specific calibration gas, the reading obtained via syringe injection can be compared to the calibration reading for the gas. Ideally, the calibration gas used would be the same as the "worst case" contaminant on-site or exhibit similar photoionization behavior.

4. Special Notes

A. For general monitoring in environments where gas mixtures are present, the span adjustment should be set at 9.8.

B. If monitoring for a single gas is undertaken, sensitivity of the instrument to that compound may be increased by adjustment of the span. The HNu instruction manual provides tables of span settings for various compounds. This span setting is better determined empirically with a calibration gas of the substance to be detected. (Use of toxic gases for calibration purposes is typically not recommended, however.)

C. Instruments are laboratory calibrated on 30-day cycles. During projects requiring repeated use of the meter for more than one day, calibration should be checked in the field daily using a factory supplied standard gas.

D. This instrument will not detect methane but may detect other potentially naturally occurring gases such as hydrogen sulfide and ammonia. Positive instrument response does not necessarily indicate the presence of synthetic organic compounds.

E. Calibration gas concentration , lamp energy, and span setting should be reported with results. Where appropriate, detection limits for specific compounds (from the manufacturer's literature) should also be reported.

F. Three photoionization lamp energies are available from HNu (9.5 eV, 10.2 eV, and 11.7 eV). General monitoring in unknown environments should typically employ the 10.2 eV lamp. For measuring specific compounds with ionization potentials between 10.2 eV and 11.7 eV, the 11.7 eV lamp is recommended. Consult owners manual for additional information.

G. Maintenance procedures, including cleaning of the UV lamp, are specified in section 5 of the Instruction Manual.

5. Documentation

Readings will be recorded on the applicable log sheet for the work being performed in accordance with the Quality Assurance Project Plan.

6. Applicable Standards and References

Instruction Manual for Model PI-101 Photoionization Analyzer, HNu Systems, Inc.

GZA Technical Skills Seminar (Photoionization Analyzers) Program Outline dated September 18, 1986.

FIELD MONITORING - pH METER

SOP NO. 4.1.5

1. Purpose

To provide operating procedures for the Orion digital pH/mv meter in order to measure the pH of a water sample in the field.

2. Equipment and Materials

- Pre-cleaned 8-ounce glass jars
- Three Fisher-brand pH laboratory buffer solution with pH's of 4.0, 7.0, and 10.0
- Glass rod
- Distilled water
- Squeeze bottle
- Clean paper towels
- Extech 651 and 671 Digital pH/mV/Temp meters (W/AC converters)
- Meter operation and maintenance instruction manual

3. Procedures

A. Two-buffer standardization

Select two buffers whose pH values bracket the expected sample pH with one buffer being pH 7.0. Calibrate meter according to procedures outlined in the instruction manual. (Set meter to pH 7.00 with probe reading that buffer. Record meter reading of probe in pH 4.00 and/or pH 10.00 buffer.)

B. Rinse pH electrodes with distilled water between pH measurements of buffer solutions and prior to sample measurement. Wipe off carefully with paper towel or tissue.

C. Allow all samples and buffers to reach the same temperature before attempting a measurement (unless an automatic temperature probe is used). Record temperatures of buffers and samples.

D. Samples should be measured immediately after collection. Quickly stir buffers and samples with a clean glass rod prior to pH measurement. The plasticbodied, protected tip electrodes can be used as a stirring rod if care is taken to avoid scratching the glass sensing bulb.

E. Place rinsed electrode in the unknown sample and allow about one minute for the reading to stabilize. Record pH measurement as digitized on meter display. Also record temperature and mv by adjusting control switch.

F. Recalibrate meter every 2 or 3 hours if pH measurements are being made continuously.

4. Special Notes

Through a series of calculations, pH readings can be double checked with the temperature and mv readings.

5. Documentation

All field readings should be recorded on the field data record in accordance with the Quality Assurance Project Plan.

Instruction Manuals, Extech Models 651 and 671, digital pH/mV/Temp meters.

Instruction Manual, Model 701A digital pH/mv meter Orion Research.

FIELD MONITORING - CONDUCTIVITY METER

SOP NO. 4.1.8

1. Purpose

To provide operating procedures for the Extech Model 440 conductivity meter in order to measure the specific conductance of a water sample in the field.

2. Equipment and Materials

- Pre-cleaned 8-ounce glass jars
- Standard solution of 1000 umhos/cm (uS/cm) at 25° C (KCI) Glass stirring rod
- Distilled or deionized water
- Squeeze bottle
- Clean paper towels
- Extech Model 440 Conductivity Meter (with AC converter)
- Meter operation and maintenance instruction manual

3. Procedures

A. Check the instrument according to specified procedures in the manufacturer's instruction manual.

B. Calibrate the conductivity meter, following calibration procedures outlined in the instruction manual and using standard solutions of potassium chloride at conductance of 1000 umhos/cm (uS/cm) at 25° C.

C. Calculate the cell constant according to outlined procedures.

D. Avoid calibrating on one meter range and making measurements on another.

E. Maintain calibration solution and sample at the same temperature.

F. Quickly stir sample with glass stirring rod prior to placement of cell in sample.

G. Place rinsed cell in sample solution and record digitized conductance and voltage readings. Measure specific conductance immediately after sampling.

SOP 4.1.8 FIELD MONITORING - CONDUCTIVITY METER (Continued)

H. Multiply recorded measurements by the cell constant to convert to actual conductance values.

4. Special Notes

a) Siemens (S) and mhos are equivalent units.

5. Documentation

Record all readings on the field data record in accordance with the Quality Assurance Project Plan.

6. References

Extech Model 440 Conductivity Meter Instruction Manual.

ATTACHMENT II

GZA ENVIRONMENTAL CHEMISTRY LABORATORY ANALYTICAL PROTOCOLS

GZA TOTAL VOC SCREENING OF SOIL SAMPLES WITH THE HNU MODEL PI-101

OVERVIEW

This method has been developed to rapidly screen soil samples for volatile organic compounds (VOC's) to determine which individual soil samples from multilevel borings or soil test pits should be slated for more rigorous screening by headspace gas chromatography (GC). An HNU Systems Model PI-101 Photoionizer with photo-ionization detection (PID) is employed. The method is frequently subject to false positive and negative responses and, therefore, it is always reccommended that at least one sample should be analyzed from each boring by headspace GC for verification. Results from within a particular site may be compared relative to one another, assuming that the nature of contamination is consistent, to develop a depth profile or to define the areal extent of soil contamination.

METHODOLOGY

Soil samples taken in the field are placed in 250ml driller's jars to approximately three quarters full. The samples are stored at four degrees celsius and removed two hours prior to analysis to equilibrate at room temperature. The jars are shaken periodically during this equilibration time to encourage generation of the VOC's into the headspace. Prior to screening, information regarding the site may be submitted to determine which ionization source should be used with the PI-101. For example, sites known to be contaminated with 1,1,1-Trichloroethane should be screened using a PI-101 equipped with an 11.7 eV ionization source at a span setting of 5. Screening at ambient temperatures yields results based on the ionization sensitivity and vapor pressure of the contaminant. Samples are tested by: (1) punching a small hole in the lid of the driller's jar, (2) removing a 30 ml aliquot of the headspace with a glass syringe equipped with an 18 gauge needle, and (3) quickly injecting into the probe extension of the HNU PI-101. The highest meter reading is observed and the background corrected reading is recorded. The instrument is set on the most sensitive scale (0-20) to begin with and, when this scale is exceeded, is progressively set higher to the 0-200 or 0-2000 scale.

CALIBRATION AND QUALITY CONTROL

The HNU PI-101 calibration is checked daily with an internal standard (Isobutylene, chosen for its non-toxicity) that is referenced to Benzene. If the instrument sensitivity fluctuates plus or minus ten percent the instrument is recalibrated. The same procedure is followed for both 10.2eV and 11.7eV instruments. An instrument operation log book is kept to document calibration, maintenance, servicing and battery recharging. Background readings under laboratory conditions should range between 0.3 and 0.7. Background readings beyond this range indicate contamination of the instrument or lab air or that the instrument requires maintenance.

REPORT FORMAT

Samples are formatted on the report according to boring or test pit numbers and sequentially with depth. Air blanks are run subsequent to contaminated samples and results reported. The highest result from each boring group is marked "refrigerator" to indicate that the sample will be stored at four degrees celsius for further analysis. Negative results are reported as "N" and may be due to "clean" air at the site or the presence of a high concentration (percent-level) of a non-ionizable species, such as methane or carbon dioxide. Positive results are reported to two significant digits and are recorded in the appropriate sensitivity column of the format 0-20, 0-200 and 0-2000 ppm. "Off Scale" is recorded when a response scale has been exceeded. Background corrected sample readings less than twice the observed background are not considered significant, i.e. beneath the method detection limit.

DISCLAIMER

Total concentrations of volatile organic compounds determined are semi-qualitative results. The method is designed to yield data for plotting contamination trends only, not as quantitative results. A percentage of each sampling round should be subjected to higher level analysis such as headspace GC screening for verification.

LABORATORY CONTACT PERSON:

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320 Needham Street
Newton Upper Falls, MA 02164
Phone #: (617) 969-0050, x169

REFERENCES

Benoit, E.G. (Deputy Director, Operations. Office of Incident Response. DEQE.), Open letter "...adenda to the Interim Policy for Management of Residuals under M.G.L. Chapter 21E from Spills/Releases of Virgin Petroleum Oils, Jar Headspace Analytical Screening Procedure", (1988).

HNU Systems Inc., Model PI-101 Photoionizer Instruction Manual.

Langhorst, M.L., "Photoionization Detector Sesitivity of Organic Compounds," Paper presented at the 1980 Pittsburgh Conference of Analytical Chemistry and Applied Spectroscopy.

1/91/DM

GZA HYDROCARBON FINGERPRINTING TECHNIQUE BY GAS CHROMATOGRAPHY-FLAME IONIZATION DETECTION

(PHC FINGERPRINT, GC-FID)

OVERVIEW

The methodology employed by GZA to determine hydrocarbon content in solid and aqueous environmental samples is a modification of ASTM Method D3328-78 in conjunction with a method developed by the U.S. Coast Guard. Data obtained by this method include an accurate total concentration of hydrocarbon content and an identification based on comparisons with laboratory petroleum standards. Identifications may also be made utilizing a virgin petroleum product acquired from a suspected source at the site.

METHODOLOGY

Solid samples are extracted using a 30 gram subsample which is initially mixed with anhydrous sodium sulfate (Na2SO4) to remove water from the matrix. The sample is subsequently mixed with pentane to form a slurry which is then extracted via sonic disruption. This process is repeated three times and the collected extract is cleaned up using a silica gel solid phase extraction (SPE) column. The collected elutriate is automatically concentrated to a 1 milliliter volume with a Zymark Turbovap Evaporator to enhance detection limits of the method. Aqueous samples are extracted using a 200ml aliquot in a liquid/liquid extraction device using the solvent pentane. The extraction is repeated three times and the resulting extract is prepared following the same method as with solid environmental samples.

INSTRUMENTATION

The prepared extract is analyzed for hydrocarbon content using a Hewlett Packard Model 5890A Gas Chromatograph equipped with twin flame ionization detectors and a dual column capillary inlet system. The two Megabore capillary columns chosen for the analysis are a 30meter DB-5 and a 30meter DB-1. The sixty-five minute analysis is electronically controlled by a HP 7673A Autosampler and data are acquired with a Nelson Analytical 760 Series Intelligent Interface. The chromatographic data are then transmitted to an IBM AT personal computer and analyzed using the Nelson Analytical 2600 Series Chromatographic Software. The information for the analytical report is entered manually onto a Lotus Symphony Spreadsheet. The automation of the system allows the analyst to set optimum sample arrangement including calibration standards, method blanks, and duplicates.

QUALITY CONTROL

The gas chromatograph is calibrated using an average response factor determined for hydrocarbons that is calculated from internal and surrogate standards. The calibration is checked with every batch of samples by analyzing petroleum hydrocarbons of known concentration. Identification of petroleum product type is made by comparison with laboratory standards or with suspect petroleum sources on an individual site basis. Tracer compounds such as the isomer pair phytane/ n-octadecane are routinely used to determine the degree of product "weathering" as in the case of fuel oil number 2. The surrogate standard o-terphenyl is added to samples and method blanks to determine the extraction efficiency of the applied method as a surrogate recovery.

REPORT FORMAT

The method detection limit for total hydrocarbon content has been determined empirically and is modified for each sample as a function of the dilution factor. The total concentration is summarized in the row labeled "Hydrocarbon Content". All reported results for hydrocarbon analysis environmental samples are reported in ug/g (ppm) unless otherwise indicated. Detection limits for individual hydrocarbons are reported for the purpose of determining levels of priority pollutant constituents of petroleums such as polyaromatic hydrocarbons (PAH's). Surrogate recoveries are reported for all method blanks and samples.

DISCLAIMER

Identities and concentrations of petroleum hydrocarbons reported in this analytical method are subject to the limitations inherent in the cited methods. This method is not an approved EPA method but is currently undergoing a review by the ASTM Committee D-29 on water for upgrades and certification.

LABORATORY CONTACT PERSON:

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Environmental Chemistry Laboratory
GZA GeoEnvironmental, Inc.
Massachusetts Laboratory I.D. No. MA092
Telephone#: (617) 969-0050, x 169

REFERENCES

ASTM, "Standard Methods for Comparison of Waterborne Petroleum Oils by Gas Chromatography," Designation D3328, (1982).

U.S. Coast Guard, "Oil Spill Identification System by Gas Chromatography," Report No.: CG-D-52-77, (1977) Commonwealth of Massachusetts DEP, "Minimum Standards for Analytical Data for Remedial Response Actions Under M.G.L. c.21E", Policy #WSC-89-004 (1990).

U.S. Coast Guard, "Analytical Method for Oil Spill Identification by Gas Chromatography", Central Oil Identification Laboratory (1988).

U.S. EPA "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", SW-846 Third Edition, Volume 1B, Method 3550: Sonication Extraction, Method 3630: Silica Gel Clean up (1986).

1/91/DM

APPENDIX B

QUALITY ASSURANCE/QUALITY CONTROL PLAN

PHASE II
COMPREHENSIVE SITE ASSESSMENT
NEMCH PARCEL 1-C
BOSTON, MASSACHUSETTS
DEP SITE NO. 3-3485

PREPARED FOR:
New England Medical Center Hospital
Boston, Massachusetts

PREPARED BY:
GZA GeoEnvironmental, Inc.
Newton Upper Falls, Massachusetts

February 1992
File No. 12648.2

Approvals:

Mary B. Hall Project Manager	James V. Errico Associate Principal

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1.00 GENERAL INFORMATION

1.10 PROJECT DESCRIPTION

This project consists of a Phase II - Comprehensive Site Assessment of the New England Medical Center Hospital (NEMCH) Parcel 1-C site in Boston, Massachusetts. The study is designed to meet the specific requirements of the Massachusetts Contingency Plan as outlined in 310 CMR 40.545. Further description of the site and project background information are provided in Section 1.00 of the Phase II - Scope of Work.

1.20 PROJECT ORGANIZATION AND RESPONSIBILITIES

Mr. James V. Errico will be the Associate Principal-In-Charge for the project, maintaining ultimate responsibility for work staffing and completion. Ms. Mary B. Hall will be Project Manager for the work, managing the field investigation, data evaluation and report development phases of the work. Quality Assurance/Quality Control (QA/QC) for the project will be independently monitored by the Consultant/Reviewer, Ms. Sara Hanna. Field and office staff on the project will report to the Project Manager.

1.30 QA OBJECTIVES

The overall objective of the quality assurance program is to insure collection and analysis of samples in a way such that evaluations performed for the Phase II - Assessment are scientifically reliable and supportable. The precision and accuracy of field measurements will be maintained by adherence to appropriate GZA Standard Operating Procedures (SOPs). For laboratory measurements of chemical parameters, precision and accuracy goals are specified in the analytical protocols and laboratory QA/QC program. The general focus of the quality control program is to provide an internal review of field procedures; sample collection, transport and preservation procedures; and analytical protocols to ensure that the data generated during the course of the Phase II - Assessment is scientifically reliable.

2.00 FIELD DATA QA/QC

2.10 FIELD SAMPLING AND TESTING PROCEDURES

Quality control for field measurements will be assured by conformance with SOPs fo these activities. Field work will be documented by maintaining the following:

- Field log books (bound)
- Boring and groundwater sampling logs
- Field activity summary sheets
- Sample identification documents
- Sampling tags
- Chain-of-custody records

Any deviation from the SOPs will be documented in the field log books and summar sheets.

2.20 SAMPLE LABELLING, CONTROL AND CUSTODY

The accountability of a sample begins when the sample is removed from its natura environment. Sample labels, chain-of-custody forms, and field data records (borin logs) will be completed at the time of sampling. Chain-of-custody forms are to b filled out completely in accordance with relevant SOPs. Entries will be made i waterproof ink during sampling. The following chain-of-custody procedure will b implemented by the field representative to promote sample integrity.

The samples are under custody of the field sampler if:

- they are in his (or her) possession
- they are in view after being in possession
- they are locked up or sealed securely to prevent tampering; or
- they are in a designated secure area.

The original of the chain-of-custody form will accompany the samples at all times afte collection. A copy of the chain-of-custody form is kept by the field sampler.

When samples are transferred in possession, the individuals relinquishing and receiving will sign, date, and note the time on the chain-of-custody form. When samples are shipped, the field sampler will note the method of shipment, courier name, and way bill number in the "remarks" box on the form. The field sampler will keep a copy of the way bill and attach it to his (or her) copy of the chain-of-custody form.

The chain-of-custody form will contain information to distinguish each sample from other samples. This information will include:

- the project for which sampling is being conducted
- the matrix being sampled (air, groundwater, soil, etc.)
- the sampling date and time
- the specific sampling location
- the method of sampling to include preservation techniques
- significant observations made during the sampling process
- signature of the person performing the sampling

Each sample will be assigned a unique identification number, marked on the sample container in waterproof ink, and recorded on the chain-of-custody form. The chain-of-custody form will be forwarded to the laboratory with the samples. As a precaution against this record being lost or altered, the sampling personnel will retain a copy of the chain-of-custody form documenting the information up until the first change of sample custody. This record will be filed by the Project Manager. Field measurements (e.g., pH, specific conductance, temperature, depth, flow, etc.) will be recorded on the field data record sheets or field log books.

2.30 SAMPLE HANDLING AND SHIPMENT

Collection, containment, preservation, handling and shipment of samples will be completed in accordance with the appropriate EPA, ASTM, or other methods for the analytical parameters of interest. These are listed in the sampling and analysis plan. Appropriate containers and preservation techniques will be employed to ensure sample integrity and chain-of-custody protocols will be observed during shipment.

2.40 FIELD EQUIPMENT CALIBRATION

Field instruments used during the Phase II - Assessment will be periodically calibrated to ensure accuracy. Calibration and preventive maintenance for field instruments are described below.

2.41 pH Meter Calibration

The pH meter must be calibrated a minimum of twice each day using two different pH buffer solutions expected to bracket the pH range of field samples. Rinse the probe thoroughly between buffer measurements with distilled water and again after calibration is completed. Record in the field log book what buffer solutions were used. When the meter is moved, check pH reading by measuring the pH value of the buffer solution closest to the expected range of the sample. If the reading deviates from the known value by more than 0.1 standard units, recalibrate the instrument as described above. If unacceptable deviations still occur, consult the operating manual for remedial course of action.

2.42 Conductivity Meter Calibration

The specific conductance/temperature meter is less likely to exhibit random fluctuations and will only require daily checks against a known KCL solution, which should be chosen to be within the expected conductivity range. Note that specific conductance is temperature-dependent and therefore the meter readings must be adjusted to reflect the temperature of the standard solution. Thoroughly rinse the probe with distilled water after immersing in KCL standard solution. In addition to daily checks of the conductivity readings, the thermistor readings must also be checked daily. This is accomplished by taking a temperature reading of the KCL standard solution with both the conductivity probe and mercury thermometer.

2.43 PID Calibration

The photoionization organic vapor detector (H-Nu) will be calibrated daily using an analyzed gas mixture provided in a pressurized container, according to the manufacturer's instructions. Battery check with electronic zeroing of the instrument will be performed at two-hour intervals during periods of continuous use.

2.44 Thermometer Inspection

Before use, the thermometer will be visually inspected to assure there is no break in the liquid column. If there is a break, the spare thermometer will be visually inspected. If both thermometers have a break in the liquid, neither can be used and a replacement must be obtained.

All field water quality measurements will be obtained in accordance with the appropriate GZA SOPs.

2.50 FIELD QA/QC SAMPLES

QA/QC samples to be submitted to the laboratory include: (1) trip blanks; (2) field blanks; and (3) duplicates. These samples provide a quantitative basis for validating the data reported.

2.51 Trip Blanks

Trip blanks are used to assess the concentrations of volatile organics reported in water samples. The trip blank, which is prepared by the laboratory, consists of a VOC sample container filled with reagent water which is shipped to the site with the other VOC sample containers. Two trip blanks are included with each shipment of water samples scheduled for volatile organic analysis. The containers are carried to the field and are stored with the samples during sampling activities. One of the two trip blanks may be analyzed with the environmental VOC samples; the second blank can also be analyzed if VOCs are detected in the first.

2.52 Field Blanks

Field blanks will be prepared during each sampling event using organic-free water (in groundwater sampling rounds) or clean silica sand (soil sampling rounds). The field blank will be handled as a sample using sampling equipment and containers.

This blank will be analyzed for VOCs and for other parameters, as appropriate. At least one field blank will be collected per sampling event.

2.53 Duplicates

Duplicates of environmental samples amounting to an average of 10 percent of each type of sample (e.g., soil, groundwater) will be submitted for analysis of all parameters specified for those samples. The identity of the duplicate samples will not be revealed to the laboratory.

3.00 LABORATORY QA/QC

3.10 ANALYTICAL PROCEDURES AND QA/QC

GZA's Environmental Chemistry Laboratory's (ECL) analytical methodologies are presented in the sampling and analysis plan. Contract laboratory analysis procedures will conform to appropriate EPA protocols for the parameters of interest (refer to the sampling and analysis plan for specific method references). QA/QC for GZA and outside contract laboratory analyses will be maintained by adherence to relevant protocols, laboratory QA/QC procedures and DEP guidance ("Minimum Standards for Analytical Data for Remedial Response Actions under MGL C21E," January 19, 1990). Laboratory QA/QC protocols will be documented in the analytical data reports.

3.20 DATA REDUCTION AND REPORTING

Data reduction and reporting for laboratory work will conform to appropriate guidelines in the relevant analytical methodologies and in DEP's "Minimum Standards for submission of Analytical Data for Remedial Response Actions under MGL C21E," dated January 19, 1990.

4.00 QA AUDITING

4.10 PERFORMANCE AUDITS

GZA's ECL actively participates in EPA interlaboratory performance evaluation programs. Contract laboratories used in this study will also be participants in these programs. Internal audits are also a component of each laboratory's QA/QC program.

For field measurements and data evaluation tasks, the GZA Project Manager will monitor QA procedures to ensure that data of acceptable quality are provided. Calculations will be independently checked by GZA technical staff. Data summaries, interpretive plans and written reports will be developed by the project manager and technical staff and reviewed by the Associate Principal-In-Charge. This information will also be independently reviewed by a senior technical staff member (Project Consultant/Reviewer).

4.20 PROCEDURES TO ASSESS PRECISION, ACCURACY AND COMPLETENESS

For analytical data, routine procedures to assess precision, accuracy, and completeness are outlined in the relevant analytical protocols and the laboratory's internal QA plans. Precision, the degree to which a measurement is reproducible, is assessed by comparison of replicate analyses. Accuracy is an assessment of the degree of agreement of a measurement with an accepted reference value. This is usually reported as percent recovery, referenced to a surrogate standard or known quantity of an added analyte. Completeness is a measure of the percentage of valid data obtained compared with the amount that was expected to be obtained.

4.30 CORRECTIVE ACTION

When data is found to be incomplete or unacceptable or non-conformance with stated QA objectives is noted, corrective action steps shall be initiated. The Project Manager or Consultant/Reviewer shall notify the Associate Principal-in-Charge and take corrective actions. These may include:

- For data omissions, resampling or reanalysis of the sample in question;
- For conflicting data, review of supporting documentation, followed by resampling and/or analysis if necessary;
- For data which falls outside of acceptable ranges for precision or accuracy, the cause of the poor performance shall be evaluated. An explanation of performance deficiencies shall be provided and resampling/reanalysis conducted if deemed necessary by the Associate Principal-in-Charge.

4.40 REPORTING

QA/QC procedures employed during the project will be documented in the Phase II - Report. Laboratory QA/QC protocols and data documenting analytical accuracy and precision will be included in the laboratory data reports. Results of performance, audits, identification of significant QA/QC problems, and any corrective action steps taken will be included in the discussion of QA/QC in the Phase II - Report.

APPENDIX C

HEALTH AND SAFETY PLAN

PHASE II
COMPREHENSIVE SITE ASSESSMENT
NEMCH PARCEL 1-C
BOSTON, MASSACHUSETTS
DEP SITE NO. 3-3485

PREPARED FOR:
New England Medical Center Hospital
Boston, Massachusetts

PREPARED BY:
GZA GeoEnvironmental, Inc.
Newton Upper Falls, Massachusetts

February 1992
File No. 12648.2

HEALTH AND SAFETY PLAN - GZA GeoEnvironmental, Inc.
(Rev.2/91)

All field personnel should review the contents of this plan prior to commencing field work. This plan is prepared for use only by personnel from GZA GeoEnvironmental, Inc., for field work where the potential or known contaminants consist of organic compounds, solvents, VOCs, and/or petroleum products, for use on:

ENVIRONMENTAL SITE ASSESSMENTS

JOB NAME N.E. Medical Center Parcel 1C JOB NO. 12648.2

SITE ADDRESS Intersection of Washington Ave & Oak St., Boston

ESTIMATED START DATE 2/92 ESTIMATED COMPLETION DATE

SITE DESCRIPTION Paved parking area and employee picnic area (gravel)

NATURE OF FIELD WORK Six - eight shallow borings; 2 monitoring wells

WILL THIS JOB INVOLVE "CONFINED SPACE" WORK ? (indoor drilling, tank entry, etc.) Yes____ No ✓

If yes, explain:

ARE UTILITY NOTIFICATIONS NEEDED FOR SUBSURFACE WORK ? Yes ✓ Not Applicable____

If yes, specify clearance dates, clearance I.D. #, and other relevant information:

Digsafe & BWSC will be notified prior to performing work

PRIMARY LEVEL OF PROTECTION: Level D - Standard work clothes and work boots with the provision to use chemical protective clothing, as needed, including coveralls, protective gloves, over boots, and similar protective garments.

CONTINGENCY LEVEL OF PROTECTION: Level C - Consists of Level D with the addition of a full-face air purifying respirator with appropriate cartridges.

DIRECTIONS, DIAGRAM, OR MAP OF ROUTE TO NEAREST HOSPITAL ATTACHED: YES ✓ SITE MAP ATTACHED

EMERGENCY PHONE NUMBERS:

HOSPITAL:____ **AMBULANCE:** 911 **FIRE:** 911 **POLICE:** 911

HOSPITAL NAME & ADDRESS: New England Medical Center (NEMC)
750 Washington Street

OTHER EMERGENCY CONTACT:____ PHONE NO.____

LOCATION OF NEAREST PHONE In building(s) across street (part of NEMC complex)

SITE PERSONNEL QUALIFICATIONS:

MEDICAL MONITORING: Participation in the medical monitoring program is required for Level C activities, otherwise optional.

HEALTH & SAFETY TRAINING: The field supervisor, and all persons participating in Level C activities, must have received at least 40 hours of relevant health and safety training, and annual refresher training, covering hazard recognition, site monitoring instruments, personal protective equipment, etc.

RESPIRATOR FIT TEST: For Level C work, site personnel must have been satisfactorily fit-tested with their respirator within the previous 12 months.

CHEMICAL & FIRE HAZARDS

Source and Location of Potential Contamination:
Soils showed low to moderate levels of petroleum hydrocarbons
and polyaromatic hydrocarbons.
VOC's detected in one previous boring (assoc. w/ PHCs)

Representative Chemicals		Exposure Limit (TLV or PEL)	Ionization Potential (eV)
Benzene	assoc. w/ PHC's	1 ppm	9.24
Toluene		100 ppm	8.82
Ethylbenzene		100 ppm	8.76
Xylene		100 ppm	8.45

Unique chemical characteristics (odor, warning properties, etc.):
petroleum/oily odor

Major Routes of Exposure: Inhalation of vapors (volatile compounds) and absorption through the skin (volatil and non-volatile compounds)
Symptoms of Exposure: Dizziness, poor coordination, headache, nausea, abdominal pain, general malaise, fainting, irritation of eyes or skin.
Health Effects: Skin contact can cause drying, cracking, and irritation of the skin. Inhalation of vapors or absorption of chemical through the skin may result in liver, kidney, neurological, circulatory, respiratory, or reproductive damage. Many organic solvents can cause cancer or birth defects. Petroleum products are generally considered less toxic than many organic solvents, however certain products contain very toxic components; gasoline, coal tar, crude oil & waste oil contain cancer-causing agents.

GENERAL FIRE HAZARDS: The flammability of organic solvents and petroleum products varies greatly. Chlorinated solvents, oils, and greases generally do not ignite easily, and do not represent a severe explosion hazard. Gasoline and many non-chlorinated solvents are extremely flammable, and may pose a serious explosion hazard. Ignition sources should be eliminated from the work zone. If high concentrations of flammable compounds are expected, monitoring should be conducted with a combustible gas indicator (LEL meter).

SITE-SPECIFIC FIRE HAZARDS: no unusual fire hazards anticipated

ADDITIONAL SITE-SPECIFIC HAZARD INFORMATION: no unusual hazards anticipated

GENERAL HAZARDS & PRECAUTIONS

ysical Hazards: Maintain an orderly work area to reduce the risk of injuries from slips, trips, falls, falling bjects, etc. Trenching and excavations shall be conducted in accordance with applicable regulations.

iological Hazards: During warm weather, take precautions for poisonous plants, biting insects, and similar hazards; r more information, contact Health & Safety personnel.

oise: Hearing protection (ear muffs or plugs) should be used when working near a source of loud noise.

xtreme Heat & Cold: When working under severe temperature conditions, precautions should be taken to maintain proper dy temperature and fluid balance; for more information, contact Health and Safety personnel.

BEWARE OF CONFINED SPACES

NFINED SPACES at any site may unexpectedly contain TOXIC or EXPLOSIVE vapors, or LOW OXYGEN LEVELS - these conditions y be LIFE-THREATENING! Any partially or fully enclosed space in which there is a MINIMUM OF VENTILATION is a confined ace. Examples include: indoor drilling operation, chemical storage closet, drywell, manhole, storage tank, steam nnel, trench, test pit, drainage conduit, etc. If you have doubts about the safety of a confined space, DO NOT ENTER - EK ASSISTANCE; consult with someone who is familiar with the space, or contact Health & Safety personnel. If your rk requires confined space entry, air monitoring and safety procedures must be planned with the guidance of the Health d Safety staff.

SITE HEALTH & SAFETY PROCEDURES

OCEDURES FOR NON-INTRUSIVE WORK (Site "Walk-Over", Geophysical Work, etc.):

no special requirements for non-intrusive work

OCEDURES FOR INTRUSIVE SITE WORK (Drilling, Test Pits, Sampling, etc.):

. **PERSONAL PROTECTIVE EQUIPMENT (PPE):** Bring "Ready bags" to the site on a daily basis. Personnel who have not been issued a respirator may participate only in Level D activities, and must stop working if the Level C action level is reached.

Ready-Bag Equipment List:

- Full-face air-purifying respirator
- Standard respirator cartridges for ready bags; combination cartridges designed for organic vapors, acid gases, and particulates; color-coded yellow and magenta
- Hearing protectors; earmuffs or earplugs
- Eyeglass kit for respirator (for those needing glasses)
- Hardhat
- Chemical protective outer gloves (Trionic, or similar)
- Chemical protective inner gloves (vinyl surgical gloves)
- Chemical potective coveralls (regular and poly-coated Tyvek)
- Safety glasses
- Outer Boots (either re-useable "slush boots" or disposable latex type)

Additional PPE: none

. **MONITORING EQUIPMENT REQUIRED ON-SITE:**

X Organic Vapor Detector: Photo-ionization Detector (H-Nu, or equivalent) 10.2 eV Lamp, or field gas chromatograph (Century OVA, or equivalent)

NA Combustible Gas Indicator/Oxygen Meter (CGI or O2-LEL Meter)

___ Other: Benzene Tubes and Sensidyne Pump

C. ACTION LEVELS:

1. Organic Vapor Detector (H-Nu, OVA) - Breathing Zone Readings:

0 to 25 instrument units............Remain in Level D.

25 to 50 instrument units............Withdraw from work area, and proceed to Level C protection for re-entry, or discontinue operation.

> 50 instrument units............Secure operations, withdraw from work area, and discontinue work at that location until contaminants can be evaluated, and H & S plan revised.

2. O2/LEL Meter (if specified in Section B) - Readings Near Vapor Source:

- 0 to 10% LEL near vapor source....work with caution; do not allow sources of ignition in work zone.
- > 10% LEL near vapor source.......implement vapor control measures (i.e. foam, sand, polyethylene film, portable blower etc.)
- Oxygen levels; a) normal levels are between 20% and 22% - oxygen levels outside of this range indicate a potential serious health risk - withdraw from the area
  b) below approximately 8% oxygen, the LEL meter will not detect combustible gas

3. Action Levels for other equipment (if specified in Section B):

Benzene (parts per million)
0-1 ppm - Remain in Level D
1-5 ppm - Withdraw from workarea proceed in Level C for reentry
>5 ppm - Secure operations, withdraw from work area and discon
work at that location until the H&S plan is revi

D. PROCEDURES: (also see Section E for site specific procedures)

- Begin working in Level D as indicated below:

✓ Begin working in regular work clothes; don chemical protective coveralls, gloves and overboots if contamination is encountered

____ Wear chemical protective coveralls, gloves and overboots at all times

The site supervisor shall select protective clothing appropriate for work tasks, based on site observations and/or monitoring results.

- No smoking, eating or drinking in the work zone.
- Wear hard hat where overhead hazards exist.
- Wear hearing protection near source of loud noise.

* Wear chemical protective gloves when handling soil samples or contaminated equipment.

- Monitor soils and breathing zone air as specified above.
- Observe action levels as indicated in Section C, "Action Levels".

E. ADDITIONAL (SITE-SPECIFIC) HEALTH & SAFETY PROCEDURES: none

F. SITE CONTROL: Do not allow onlookers or other unauthorized personnel within the established work zone; site personnel shall designate an appropriate work zone around the work area having a radius of 25 feet or more, as appropriate. If work is to be conducted in an unsecured area with pedestrian access, mark off the established work zone with traffic cones, caution tape, warning placards, etc., as appropriate.

G. PERSONNEL & EQUIPMENT DECONTAMINATION:

- Remove gross contamination from tools, respirator, monitoring equipment, boots, etc. prior to leaving the work-site.
- Either completely decontaminate soiled equipment at the work-site using detergent & water (if possible), or wrap equipment in plastic bag for transport until complete decontamination is possible.
- Dispose of contaminated gloves, Tyvek suits, used cartridges, paper towels, etc. by placing in a plastic bag in preparation for proper disposal.
- Wash hands & face thoroughly with soap and water before lunch or coffee breaks, and after finishing work for the day.

EMERGENCY PROCEDURES

ALL INJURIES AND CHEMICAL EXPOSURE INCIDENTS MUST BE REPORTED TO THE DISTRICT HEALTH AND SAFETY OFFICER AND AN ACCIDENT INVESTIGATION REPORT FILLED OUT WITHIN 24 HOURS AFTER THE ACCIDENT.

PERSONAL INJURY - Administer appropriate first aid and/or seek medical attention. For serious injury DO NOT move the victim--immediately summon ambulance. Contact the District Health and Safety Officer.

CHEMICAL EXPOSURE - For symptoms of inhalation exposure, retreat to fresh air for recovery. For skin or eye contact with chemicals, wash affected skin with soap and water, or flush eyes with water. If serious, transport victim to nearest hospital. Contact the District Health and Safety Officer.

FIRE - In the case of fire, immediately contact the Fire Department. If explosion hazard is present, do not attempt to extinguish; evacuate all personnel to a safe area. Contact the District Health and Safety Officer.

IMPORTANT

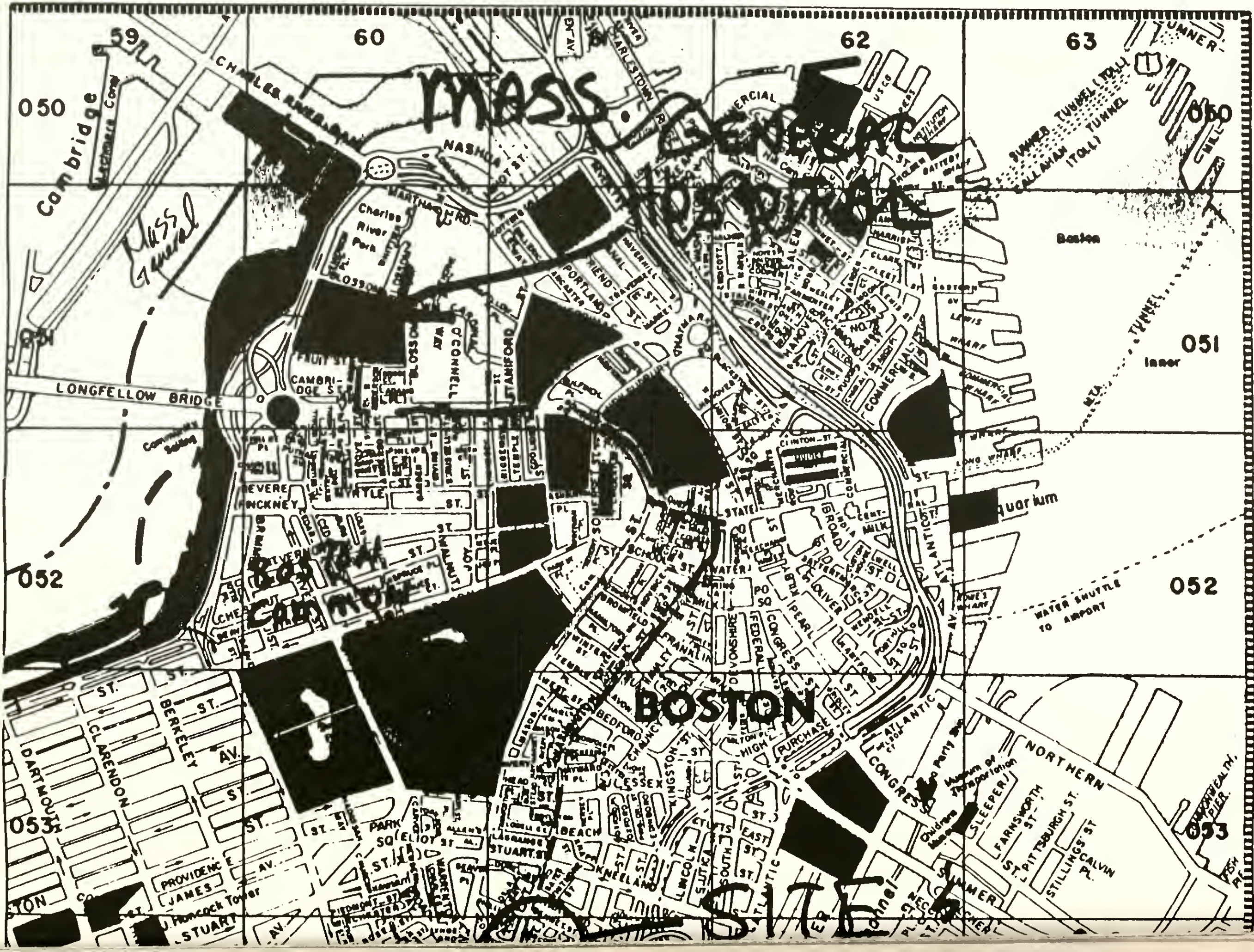
IF SITE OBSERVATIONS, SAMPLING RESULTS, OR OTHER INFORMATION INDICATES SITE CONDITIONS DIFFERENT FROM THOSE DESCRIBED HEREIN, OR IF THE TECHNICAL SCOPE OF WORK IS MODIFIED, THIS HEALTH AND SAFETY PLAN BECOMES VOID, AND A REVISED PLAN MUST BE REVIEWED BY THE HEALTH AND SAFETY STAFF!

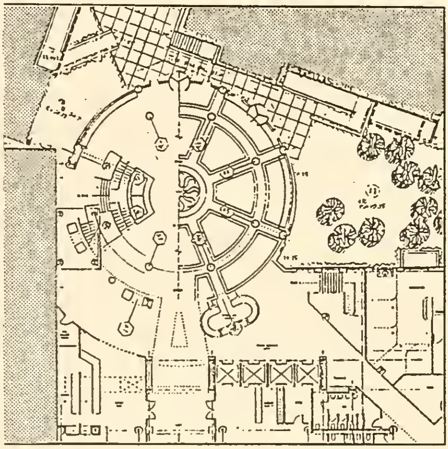
KEY PERSONNEL

PROJECT MANAGER Mary Hall PIC/AIC Jim Ernco

HEALTH & SAFETY PLAN PREPARED BY Mary Hall DATE 1/14/92

HEALTH & SAFETY PLAN REVIEWED BY Laurie A. Farnell DATE 1/15/92
Health & Safety Representative


59
60
62
63
050
051
052
053
Cambridge
Lechmere Canal
CHARLES RIVER DAM
NASHUA
Charles River Park
MARTHA RD.
LONGFELLOW BRIDGE
CAMBRIDGE ST
FRUIT ST
O'CONNELL WAY
STANIFORD
PORTLAND
CHARLESTOWN
COMMERCIAL
SALEM
HANOVER
NO. SQ.
LEWIS WHARF
COMMERCIAL WHARF
LONG WHARF
Aquarium
SUMNER TUNNEL (TOLL)
CALLAHAN TUNNEL (TOLL)
Boston
Inner
MTA TUNNEL
WATER SHUTTLE TO AIRPORT
ATLANTIC AV.
STATE
BROAD
INDIA
MILK
CONGRESS
PEARL
OLIVER
FEDERAL
DEVONSHIRE
WATER
SCHOOL
FRANKLIN
BROMFIELD
WINTER
TEMPLE
SUMMER
BOSTON
CHAUNCY
BEDFORD
KINGSTON
ESSEX
HIGH
PURCHASE
NORTHERN
CONGRESS
SLEEPER
FARNSWORTH ST
PITTSBURGH ST
STILLINGS ST
CALVIN PL.
Museum of Transportation
Children's Museum
Tea Party Ship
COMMONWEALTH PIER
SOUTH
EAST
LINCOLN
UTICA
KNEELAND
BEACH
STUART ST
PARK SQ
ELIOT ST
WARRENTON
TREMONT
REVERE
PINCKNEY
MYRTLE
WALNUT
BRIMMER
CHESTNUT
BEACON
BERKELEY
CLARENDON
DARTMOUTH
PROVIDENCE
JAMES
Hancock Tower
STUART
Community Sailing
Mass General Hospital
Mass General
Boston Common
SITE 6



Appendix H: Historic Resources

City of Boston
The Environment
Department

Raymond L. Flynn
Mayor

orraine M. Downey
Director

ston City Hall/Room 805
ston, Massachusetts 02201
7/725-4416 or 725-3850

MEMO

To: Terry Guen, CLHS

From: S. Pendery, BLC

Re: New England Medical Center

Date: February 5, 1992

I have reviewed the historical background research and maps that you have prepared on the site of the proposed New England Medical Center at 750 Washington Street and conclude that the project will have little or no impact on significant archaeological resources. While the project area was intensively used as early as the colonial period, subsequent impacts from construction of tenements and the MBTA tunnel earlier this century probably destroyed archaeological features in the block between Washington and Ash Streets.

Limited archaeological evidence for the colonial period may survive beneath Ash and Bennett Streets, however, and for this reason I would like to be notified by the project proponent two weeks prior to construction activity in this area and allowed access to the site during construction. The purpose for this is simply to observe the sequence of fills and to verify the location of the colonial period shoreline east of Washington Street. This would not delay construction at the site.

Thank you for your detailed research on the project area which has helped to expedite this review.

cc: M. Cannizzo, BLC
E. Simon, MHC

Air Pollution Control, Boston Art, Back Bay Architectural, Beacon Hill Architectural, Boston Landmarks and the Conservation Commissions

CARR, LYNCH, HACK AND SANDELL

Planners
Urban Designers
Architects
Landscape Architects
Development Advisors

Principals
Stephen Carr
Kevin Lynch 1917-1984
Gary Hack
James Sandell

Associates
Mary Jane Daly
Jean Hermann
Kathryn Madden
Laura Rutledge
Catharine Verhulst

3 February, 1992

Alan Johnson
Massachusetts Historical Commission
20 Boylston Street Room 310
Boston, Massachusetts 02116

Re: New England Medical Center,
750 Washington Street
Project No. 155

Dear Alan,

Thank you for your recent assistance compiling information for New England Medical Center's upcoming Draft Project Impact Report (DPIR) submission to the Boston Redevelopment Authority.

This letter is to comfirm that the Massachusetts Historical Commission has declined comment on this project, following review of the MEPA letter from Janet McCabe to Bob Bland of NEMC (dated January 23, 1992). This follows MHC's previous decision to decline comment on this project during the 1989 ENF review.

The Historic Resources text of the DPIR will state that the Massachusetts Historical Commission has declined comment on this project, that no action will be taken reviewing this project, as of February 3, 1992.

Please contact me immediately if you have comments or corrections to the above.

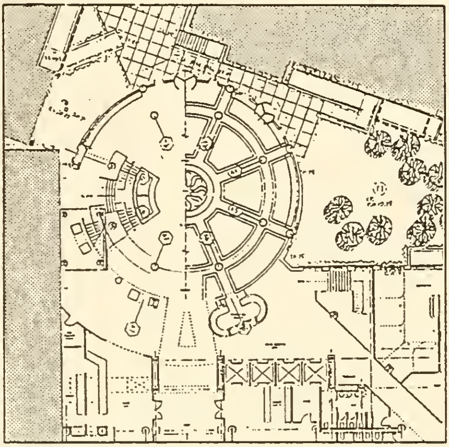
Thanks again for your help.

Sincerely,

Theresa Guen-Murray
Landscape Architect

cc: Maureen Cavanaugh, MHC
Bob Bland, NEMC
Mary Jane Daly, CLHS

1385 Cambridge Street
Cambridge, MA 02139
617 661-6566
Fax 617 661-6822
Incorporated 1980



Appendix I: Infrastructure Systems

THERMAL ENERGY
CORPORATION

RECEIVED
FEB 18 1992
LYNCH

February 12, 1992

Mr. Frederick R. Lynch
NEMC Real Estate, Inc.
750 Washington Street
NEMC #141
Boston, MA 02111

Dear Mr. Lynch:

Thank you for your letter of January 29, 1992, announcing your intention to use steam for the new NEMC hospitals.

With this letter, Boston Thermal wishes to assure you that an added 23,000 to 28,000 pounds per hour will be available for the projects. I, also, offer the following:

1. Boston Thermal Engineering Contact - Mr. David Roberts of Boston Thermal has been assigned as our Project Manager for this development. David will work with your engineering consultant as well as people from the Physical Plant Department to assure everything necessary is accomplished smoothly and professionally.

2. New Service Discount - Once the facilities are occupied and up and running, the added steam billed will qualify under the New Service Discount Program. I recall discussing this program with Bob Loranger sometime ago. This incentive program is designed to assist the payback on project inclusion of hydronic heating systems. This will require us to enter a new five year service contract with this program as a rider.

3. Construction Heating - Knowing that heating the facility prior to occupancy is normally a responsibility of the General Contractor, we wish to make you aware of a special construction heat program available only to customers sponsoring expansion.

   Under this program, we will bill either the customer or his general contractor for steam used in the expanding facility without demand charges and at the lowest marginal rate block of the demand rate. Construction heat is available for up to two winters and are not included in the New Service Program above.

210 SOUTH STREET ▪ BOSTON, MA, 02111 ▪ (617) 482-8080 ▪ FAX (617) 482-3235

Please be assured of our utmost cooperation in any and all phases of this project. I will be available to assist you at any time.

Sincerely,

Anthony E. Bolyn
Vice President
Sales and Marketing

AEB:jd

cc: B. Balcom
J. Hoey
R. Loranger
R. Polgar
D. Roberts

BOSTON EDISON
800 Boylston Street
Boston, Massachusetts 02199

November 8, 1991

Mr. Arjun Rao
BR+A
1320 Soldiers Field Road
Boston, MA 02135

Re: NEW ENGLAND MEDICAL CENTER
STATION 505

Dear Arjun:

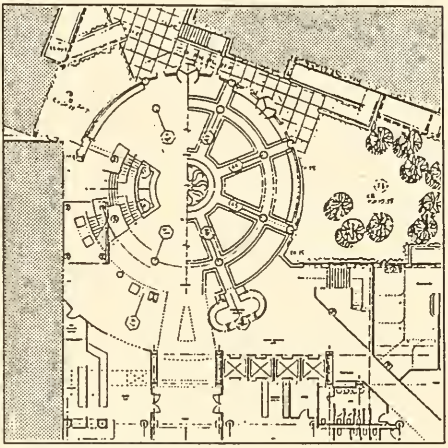
Please be advised the additional electric load planned for the proposed 350,000 square foot addition to the hospital can be accepted on the present two-line feed to station 505.

Station 505 will not require any changes in switchgear or incoming cables for this new load.

Sincerely,

George Crovo
Major Account Representative
Energy Services Department

GC/jla



Appendix J: Environmental Notification Form

New England
Medical Center Hospitals

Jerome H. Grossman, M.D.
President

1796 Boston Dispensary
1894 Floating Hospital for Infants and Children
1938 Pratt Clinic
1948 New England Center Hospital
1958 Rehabilitation Institute

The principal teaching hospitals for Tufts University School of Medicine

750 Washington Street
Boston, Massachusetts 02111
Telephone: (617) 956-5000

September 11, 1989

John DeVillars, Secretary
Office of Environmental Affairs
100 Cambridge Street, 20th Floor
Boston, MA 02202

Attn: MEPA Unit

Dear Mr. Secretary:

The New England Medical Center is submitting an Environmental Notification Form for its 1-C project for publication in the next Environmental Monitor.

We have published the intent to submit an ENF in the local newspaper and we have fulfilled all other filing requirements.

If you have any questions, please do not hesitate to contact me at 956-7576.

Sincerely,

Anne L Levine

Anne L. Levine
Director of Planning

ALL/jme

Enclosure

ENVIRONMENTAL NOTIFICATION FORM

INSTRUCTIONS

The attached Environmental Notification Form (ENF) is intended to provide the Secretary of Environmental Affairs and the general public with relatively early notification that projects are being planned which may or may not have significant impacts on the environment. The purpose of the ENF is to identify general types of impacts from a project as best as one can without having to perform final design or detailed analysis. The ENF is intended to identify those projects which may have significant impact potential, and, if so, to identify which types of impacts are significant and which are not. Through this process, the scope of any further environmental studies can be limited simply to those issues of concern, and the project proponent need not investigate those factors which are not at issue.

The process to be followed is fairly straightforward. The project proponent should fill out the ENF as accurately and completely as possible, given the preliminary state of project development. Then there will be a public review process and a determination by the Secretary whether or not an Environmental Impact Report (EIR) will be required, and if so, what topics should be covered. The Secretary will use information submitted by the project proponent in Section I.E., "Areas of Potential Impact", as the initial basis for determining the scope of an EIR, and which alternative should be studied.

The ENF itself is *not* meant to be a comprehensive environmental analysis of the project. In most cases, a best professional estimate based on available data, practice and information will suffice. More detailed information on specific items may be requested during the review of the ENF to help in performing a satisfactory environmental evaluation. The degree of accuracy will vary from project to project. If you have any questions about the degree of accuracy desirable for an ENF, call the MEPA unit (727-5830) for advice and for any other questions in filling out the form.

The sequence of procedures that proponents are advised to follow is:

1. Begin preparation of the ENF at a relatively early stage of project development.
2. Determine likely state permits and financial assistance.
3. Consult with affected agencies and assemble information useful in completing the ENF and finding out whether the project may be exempt from the MEPA process.
4. Publish the intent to submit an ENF, in a newspaper of local circulation in each community affected by the proposed project, or in a newspaper of regional or statewide circulation if an affected community is not served by a local publication. A sample form is available as Section 11.29 of the MEPA regulations. The notice should be published no more than 30 days before submitting the ENF.
5. Complete ENF and submit, with *original* U.S.G.S., to: Executive Office of Environmental Affairs, 100 Cambridge Street, Boston, MA 02202, Attention: MEPA UNIT. Send copies of the ENF and map to all participating agencies and to other appropriate entities as specified in Section 11.24 of the MEPA regulations.

The proponent is reminded that submitting an incomplete ENF or failure to transmit ENFs to all appropriate parties may result in having to resubmit the ENF and to repeat the review process.

ENVIRONMENTAL NOTIFICATION FORM

I. SUMMARY

A. Project Identification

1. Project Name New England Medical Center
Address/Location 750 Washington Street

City/Town Boston, MA

2. Project Proponent New England Medical Street
Address 750 Washington Street, Boston

3. Est. Commencement 1992. Est. Completion 1994.
Approx. Cost $ ______. Status of Project Design 2 % Complete.

4. Amount (if any) of bordering vegetated wetlands, salt marsh, or tidelands to be dredged, filled, removed, or altered (other than by receipt of runoff) as a result of the project.
0 acres 0 square feet.

5. This project is categorically included and therefore requires preparation of an EIR.
Yes x No ______?

B. Narrative Project Description
Describe project and site.

See attached 1B description

Copies of the complete ENF may be obtained from (proponent or agent):
Name: Anne Levine Firm/Agency: New England Medical Center Hospit Inc
Address: 750 Washington Street Phone No. 617-956-7576

1987 THIS IS AN IMPORTANT NOTICE. COMMENT PERIOD IS LIMITED.
For Information, call (617) 727-5830

1B NARRATIVE PROJECT DESCRIPTION

New England Medical Center Hospitals complex contains 18 buildings. The main patient care functions are located in the Farnsworth (1947), Proger (1973), Pratt (1938), Floating (1982), Rehabilitation Building (1958, and Center Building (1930), In order to continue its mission as a major regional center of medical training, education, research and treatment, the Medical Center must expand its base of services to meet demand. Inpatient admissions to the Medical Center are expected to increase 10% annually, and outpatient visits are expected to rise at a similar rate. In addition, research growth is expected to increase approximately 20% annually. The Medical Center is committed to ensuring that its growth occurs in a way that respects and promotes the planning objectives of Chinatown. To that end, we have been working with the city and the community to structure a new master plan.

Over the past year of discussions, the general parameters of the master plan have been set to include: total bed capacity of 750, replacement of outmoded inpatient care facilities, new emergency room facilities, additional research capacity, expanded ambulatory care facilities, and parking.

This project consists of two (2) new buildings that fit within the proposed new zoning code of the Chinatown District. These projects will be connected buildings along Washington Street north of Oak Street. The facility to the north, abutting the Proger building, will house a new and expanded emergency room on the first floor and will be designed to handle major trauma cases. The emergency department will be accessible from Washington Street which will therefore direct ambulance traffic away from Harrison Avenue. The upper floors of the building will house adult medical-surgical beds, additional intensive care beds, new operating room suites and research space.

The current plans call for the building to the south to provide space for a ambulatory care, maternity service, community hospital program (designed for the care of less seriously-ill patients), medical-surgical beds and research space.

The Medical Center understands Chinatown's concerns about the effect of traffic on neigborhood streets. In 1986, the Medical Center undertook a traffic study to identify ways to minimize the impact of hospital-related traffic on neighborhood streets. The Medical Center also made a commitment to meeting the majority of its parking needs outside the core of Chinatown.

Based on our preliminary traffic study (performed by the firm of Vanasse/Hangen), it appears that the Medical Center's development plans would have a relatively minor impact on traffic volume. This traffic study is in the process of being updated to examine the impact of Medical Center development and to assess the combined impacts of other development projects slated for the surrounding area.

The site currently has a surface parking lot and an empty 5 story building unit.

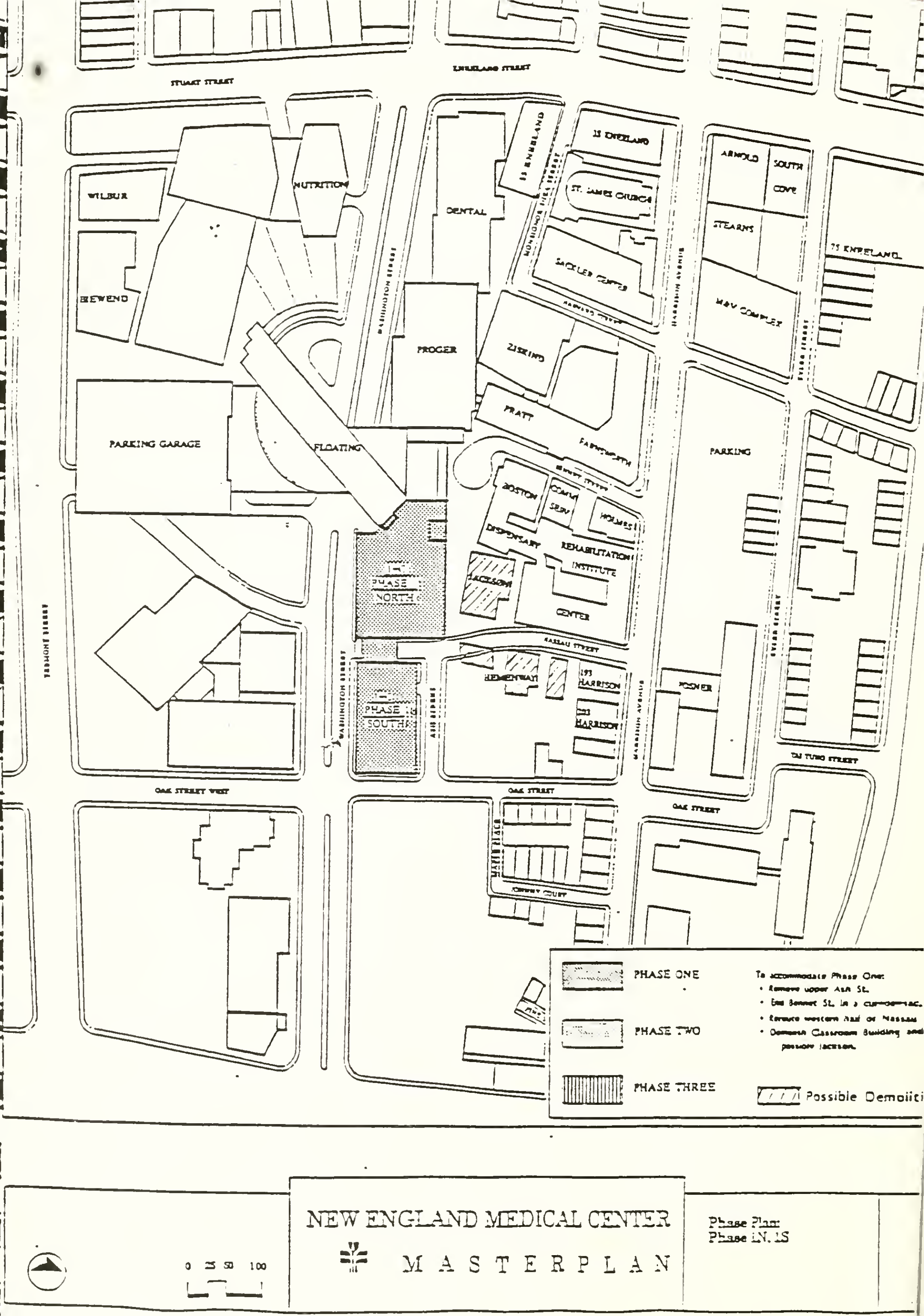
The program planned for the North Building is as follows:

SB. Mechanical
B. Hospital Services
1. Emergency Unit
2. Patient Rooms
3. Patient Rooms
4. Patient Rooms
5. Operating rooms and Day Surgery
6. Research
7. Research
8. Research

The program planned for the South Building is as follows:

B. Mechanical
1. Ambulatory Services
2. Ambulatory Care
3. Community Hospital
4. Maternity Beds
5. Maternity, Delivery and LDRP Rooms
6. Research
7. Research
8. Research

See attached map for 1-C North and South plan.



NEW ENGLAND MEDICAL CENTER

MASTERPLAN

Phase Plan
Phase 1N, 1S

C. List the State or Federal agencies from which permits or other actions have been/will be sought:

Agency Name	Permit	Date filed: file no.

See attached 1C

D. List any government agencies or programs from which the proponent will seek financial assistance for this project:

Agency Name	Funding Amount

Unknown at this time.

E. Areas of potential impact (complete Sections II and III first, before completing this section).

1. Check all areas in which, in the proponent's judgment, an impact of this project may occur. Positive impacts, as well as adverse impacts, may be indicated.

	Construction Impacts	Long Term Impacts
Inland Wetlands	No	No
Coastal Wetlands/Beaches	No	No
Tidelands	No	No
Traffic	No	Yes
Open Space/Recreation	No	No
Historical/Archaeological	No	No
Fisheries/Wildlife	No	No
Vegetation/Trees	No	No
Agricultural Lands	No	No
Water Pollution	No	No
Water Supply/Use	Yes	Yes
Solid Waste	Yes	Yes
Hazardous Materials	No	Yes
Air Pollution	Yes	No
Noise	Yes	No
Wind/Shadow	No	No
Aesthetics	No	Yes
Growth Impacts	No	Yes
Community/Housing and the Built Environment	No	No
Other (Specify)		

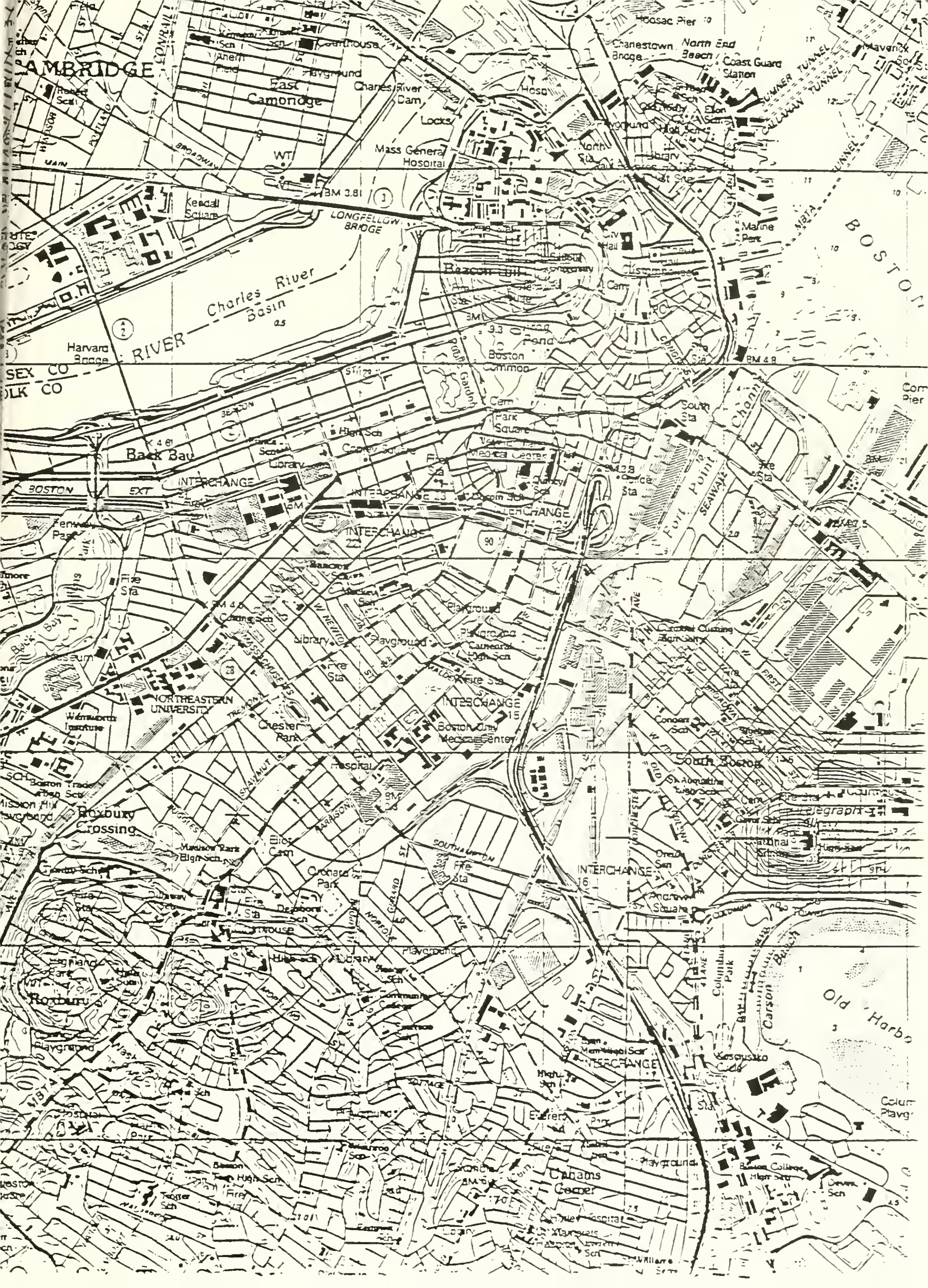
2. List the alternatives which have been considered.

Over the past five (5) years numerous options have been considered. This solution is a negotiated compromise with the Chinatown Community and the BRA.

1C. List Federal or State agencies from which permits or other actions have been or will be sought:

Agency Name	Permit	Date Filed/ File No.
Massachusetts EOEA	MEPA Approval	
Dept. of Environmental Quality Engineering - Division of Air Quality Control	Fossil Fuel Utilization Permit	
Dept. of Environmental Quality Engineering - Division of Water Pollution Control	Sewer Connection Permit	
Massachusetts Water Resources Authority	Industrial User Discharge Permit	
Federal Aviation Authority	Notice of Proposed Construction or Alteration	
Massachusetts Aeronautics Commission	Review of Building Height and Lighting	
Dept. of Environmental Quality Engineering - Division of Water Supply	Water Supply Permit	
Department of Public Health	Determination of Need	
Department of Inspectional Services	Building Permit	
Boston Redevelopment Authority	Master Plan Approval	
Department of Public Health	Plan Approval	
Department of Public Safety	Plan Approval	

Note: Each permit listed above will be filed unless further analysis shows that such permit is not required.


Hoosac Pier
Charlestown Bridge
North End Beach
Coast Guard Station
SUMNER TUNNEL
CALLAHAN TUNNEL
Maverick Sq
CAMBRIDGE
East Cambridge
Courthouse
Playground
Charles River Dam
Locks
Mass General Hospital
North Sta
Library
Kendall Square
BM 3.81
LONGFELLOW BRIDGE
MBTA TUNNEL
Marine Park
BOSTON
City Hall
Custom House
Beacon Hill
Charles River Basin
RIVER
Harvard Bridge
SEX CO
OLK CO
Frog Pond
Boston Common
Public Garden
BM 4.8
South Sta
Park Square
Fort Point Channel
SEAWALL
Back Bay
BOSTON
EXT
INTERCHANGE
High Sch
Library
Copley Square
Medical Center
Fire Sta
Fenway Park
INTERCHANGE 22
Fire Sta
Museum
Library
Playground
Cathedral High Sch
Fire Sta
INTERCHANGE 15
NORTHEASTERN UNIVERSITY
Wentworth Institute
Chester Park
Boston City Medical Center
Hospital
South Boston
Telegraph Hill
High Sch
Roxbury Crossing
Mission Hill Playground
Boston Trade High Sch
Madison Park High Sch
SOUTHAMPTON
Orchard Park
Fire Sta
INTERCHANGE 16
Andrew Square
Fire Sta
Highland Park
Roxbury
Playground
Library
High Sch
Columbus Park
Carson Beach
Old Harbor
INTERCHANGE
Kosciuszko Circle
Playground
Uphams Corner
Boston Tech High Sch
Playground
Boston College High Sch
Library
Hospital
Fire Sta

F. Has this project been filed with EOEA before? No x Yes _____ EOEA No. _____

G. WETLANDS AND WATERWAYS

1. Will an Order of Conditions under the Wetlands Protection Act (c.131s.40) or a License under the Waterways Act (c.91) be required?
   Yes _____ No x
2. Has a local Order of Conditions been:
   a. issued? Date of issuance _____; DEQE File No. _____.
   b. appealed? Yes _____; No _____.
3. Will a variance from the Wetlands or Waterways Regulations be required? Yes _____; No x.

II. PROJECT DESCRIPTION

A. Map; site plan. Include an original 8½ x 11 inch or larger section of the most recent U.S.G.S. 7.5 minute series scale topographic map with the project area location and boundaries clearly shown. If available, attach a site plan of the proposed project.

B. State total area of project: 1 acres.
Estimate the number of acres (to the nearest 1/10 acre) directly affected that are currently:

1. Developed .... 1 acres
2. Open Space/
   Woodlands/Recreation 0 acres
3. Wetlands .... 0 acres
4. Floodplain .... 0 acres
5. Coastal Area .... 0 acres
6. Tidelands .... 0 acres
7. Productive Resources
   Agriculture .... 0 acres
   Forestry .... 0 acres
8. Other .... 0 acres

C. Provide the following dimensions, if applicable:

	Existing	Increase	Total
Length in miles	0	0	0
Number of Housing Units	0	0	0
Number of Stories	0	0	0
Gross Floor Area in square feet	0		
Number of parking spaces	1773	300	2,073
Total of Daily vehicle trips to and from site (Total Trip Ends)	This information will be available after the new traffic stud is completed.		
Estimated Average Daily Traffic on road(s) serving site			
1.			
2.			
3.			

* NEMC will also be enlarging the Herald Street Garage by approximately 600 spaces, yet will lose approximately 300 spaces to other development.

D. TRAFFIC PLAN. If the proposed project will require any permit for access to local roads or state highways, attach a sketch showing the location and layout of the proposed driveway(s).

Not Applicable

III. ASSESSMENT OF POTENTIAL ADVERSE ENVIRONMENTAL IMPACTS

Instructions: Explain direct and indirect adverse impacts, including those arising from general construction and operations. For every answer explain why significant adverse impact is considered likely or unlikely to result. Positive impact may also be listed and explained.

Also, state the *source* of information or other basis for the answers supplied. Such environmental information should be acquired at least in part by field inspection.

A. Open Space and Recreation

1. Might the project affect the condition, use, or access to any open space and/or recreation area?

Explanation and Source: The project will result in enhancement of the streetscape on Washington Street.

2. Is the project site within 500 feet of any public open space, recreation or conservation land?

Explanation and Source: No.

B. Historic and Archaeological Resources

1. Might any site or structure of historic significance be affected by the project? (Prior consultation with Massachusetts Historical Commission is advised.)

Explanation and Source: Not sure to our knowledge, but a list of nearby historic sites is attached.

2. Might any archaeological site be affected by the project? (Prior consultation with Massachusetts Historical Commission is advised.)

Explanation and Source: Not to our knowledge.

C. Ecological Effects

1. Might the project significantly affect fisheries or wildlife, especially any rare or endangered species? (Prior consultation with the Massachusetts Natural Heritage Program is advised).

Explanation and Source: The Mass National Heritage Program was consulted and its spokesman stated that there was no danger from this project to rare or endangered species of fish or wildlife.

3B. Historic and Archaeological Resources

To the best of your knowledge, are any historic or archaeological properties known to exist within the area of potential project impact? If so, specify.

An inspection on April 22, 1989 of the State Register of Historic Places, as updated through Massachusetts Register #604, lists the following State Register Properties which are located within a half-mile radius of the Project and which are at the approximate distances shown below from the Project:

1. Arlington Street Church, Back Bay, Corner of Arlington & Boylston Streets. - 1300 ft.

2. Armory of the First Corps of Cadets, 97-103 Arlington Street & Columbus Ave. - 1400 ft.

3. Back Bay Historic District, Commonwealth Ave. from Arlington to Charlesgate East - 2600 ft.

4. Bay Village Historic District, Piedmont, Winchester, Melrose, Fayette & Tremont Streets. - 700 ft.

5. Beach/Knapp District, Beach & Knapp Streets. - 300 ft.

6. Bedford Building, 89-103 Bedford St. - 1500 ft.

7. Berkeley Building, 416 - 426 Boylston Street. - 2100 ft.

8. Boston Center for Adult Education, Back Bay, 535 Tremont St. - 1700 ft.

9. Boston Common Burial Ground - 800 ft.

10. Boston Common & Public Garden, Beacon, Park, Tremont, Boylston & Arlington Streets. - 750 ft.

11. Boston Edison Electric Illuminating Company, 25-39 Boylston St. corner of Bumstead Ct. - 700 ft.

12. Boylston Building, 2-22 Boylston St. & 651-657 Washington St., corner of Boylston Sq. - 750 ft.

13. Charles Playhouse, 74-78 Warrenton St. - 350 ft.

14. Church Green, 101-113 Summer St. - 1700 ft.

15. Commercial Palace Historic District, roughly bounded by Bedford, Summer, Franklin, Hawley, and Chauncey Streets. - 1500 ft.

16. Dill Building, 11-25 Stuart St. - 250 ft.

17. Filenes Department Store, 426 Washington st. - 1900 ft.

18. GSA Site K, Tremont St. between Avery & Boylston Streets, Grand Lodge of the Masons (186 Tremont St.), Boston Illuminating Co. (39 Boylston St.) - 750 ft.

19. GSA Site L, 83-87, 91-95, 101-113 Summer St., Proctor Building (100 Bedford St.). - 750 ft.

20. Hayden Building, 681-683 Washington St. corner of LaGrange St. - 450 ft.

21. Kennedy's Building, 26-28 Summer St. - 1750 ft.

22. Leather District, roughly bounded by Atlantic Ave., Surface Artery, and Massachusetts Turnpike. - 800 ft.

23. Liberty Tree Building, 629-638 Washington St., 1-4 Essex St. - 750 ft.

24. Liberty Tree District, Essex & Washington Streets. - 750 ft.

25. Locke-Ober Restaurant, 3-4 Winter Place. - 1850 ft.

26. Music Hall/Metropolitan Theatre and Office Building, 252-272 Tremont St. The Project is located within the office building portion of this property, but will not affect the theatre portion thereof.

27. Newspaper Row, 322-328 Washington St., 5-23 Milk St., 11 Hawley St. - 1850 ft.

28. Paramount Theatre, 549-563 Washington St. - 700 ft.

29. Park Street District, Tremont, Park, and Beacon Streets. - 2250 ft.

30. Piano Row, Park Sq. to Avery St., along Boylston and Tremont Streets. - 750 ft.

31. Savoy Theatre, 537-541 Washington St., 163 Tremont St. - 1000 ft.

32. Saxon Theatre, 537-541 Washington St.-1000 ft.

33. Shubert Theater, 263-265 Tremont St., corner of Seaver Place - 250 ft.

34. South Station, Atlantic Ave. & Summer St. - 2100 ft.

35. South Station Headhouse, Atlantic Ave. & Summer St. - 2100 ft.

36. South Station Interlocking System/Tower 1, Atlantic Ave. & Summer St. - 2100 ft.

37. St. Cloud Hotel, South End, 563 tremont St. - 2640 ft.

38. St. Paul's Church, 136 Tremont St., between Winter & Temple Streets & opposite the common. - 2000 ft.

39. Stearns, R.H. Building, 140 Tremont St. - 1750 ft.

40. Temple Place Historic District, 11-55, 26-58 Temple Place - 1980 ft.

41. Theatre Area Multiple Resource Area, bounded by Boylston St., Park Sq., West Bedford St., Harrison Ave., and Charles Playhouse. - The Project is within this area.

42. Tremont Street Subway, Boston Common & Tremont St. - 2250 ft.

43. United Shoe Machinery Corporation Building, 140 Federal Street - 2100 ft.

44. The Walker Building, 120 Boylston St. - 750 ft.

45. Washington St. Theatre District, 511-559 Washington St. - 700 ft.

46. West Street Historic District, West and Tremont Streets. - 1650 ft.

47. Wilbur Theater, 244-250 Tremont St. - contiguous

48. Wirth, Jacob Building, 31-39 Stuart St. - 400 ft.

49. Young Men's Christian Union, 48 Boylston St., corner of Tamworth St. - 650 ft.

50. Youth's Companion Building, 140-144 Berkeley St., & 195-217 Columbus Ave. - 2100 ft.

An inspection of the United States Geological Survey Maps for Boston, the Central Business District Preservation Study Part II: Draft Summary Findings prepared for the Boston Landmarks Commission with the assistance of the Boston Redevelopment Authority, September, 1980, the Project Completion Report Part III: Theatre Area Preservation Study, survey and planning grant 1978, by the Boston Landmarks Commission and the Boston Redevelopment Authority, the National Register Properties Boston (Suffolk County), Massachusetts, Boston Landmarks Commission Document #1920E, March 1989, and the Status of Petitions to Boston Landmarks Commission for Designation as Landmarks and Districts as of March, 1989, Boston Landmarks Commission document #1911E, revealed the following locations within a half mile radius of the Project to be of archaeological or historic significance:

1. 19-SU-13, pre-historic archaeological site

2. 19-SU-14, pre-historic archaeological site
3. 19-SU-15, pre-historic archaeological site
4. 19-SU-16, pre-historic archaeological site
5. 19-SU-29, pre-historic archaeological site
6. Proctor Building, 100-106 Bedford Street - 1300 ft.
7. Wang Theatre (interior only), 106 Boylston Street - 700 ft.
8. Colonial Theatre (interior only), 106 Boylston St. - 700 ft.
9. The Phillips Building, 120 Tremont St - 2200 ft.
10. Evans Building, 174-5 Tremont St. - 1320 ft.
11. Jewelers Building, 371-379 Washington St. - 2000 ft.
12. Auchmuty Building, 104-122 Kingston Street - 1650 ft.

2. Might the project significantly affect vegetation, especially any rare or endangered species of plant? (Prior consultation with the Massachusetts Natural Heritage Program is advised.)

(Estimate approximate number of mature trees to be removed: ______________)

Explanation and Source: The Mass National Heritage Program was consulted and its spokesman stated that there was no danger from this project to rare or endangered species of plant.

3. Agricultural Land. Has any portion of the site been in agricultural use within the last 15 years? If yes, specify use and acreage.

Explanation and Source: No use of the land for agricultural. The site has a building on part of it and the rest is the MBTA tunnel below ground and a parking lot above the tunnel.

D. Water Quality and Quantity

1. Might the project result in significant changes in drainage patterns?

Explanation and Source: No because the surfaces will be roof for the new building. The current surfaces are partially roof and partially blacktop.

2. Might the project result in the introduction of any pollutants, including sediments, into marine waters, surface fresh waters or ground water?

Explanation and Source: No because the run off from this site will end up in the City of Boston storm drains as it currently does.

3. Does the project involve any dredging? No __x__ Yes _____ Volume ______. If 10,000 cy or more, attach completed Standard Application Form for Water Quality Certification, Part I (314 CMR 9.02(3), 9.90, DEQE Division of Water Pollution Control).

4. Will any part of the project be located in flowed or filled tidelands, Great Ponds, or other waterways? (Prior consultation with the DEQE and CZM is advised.)

   Explanation and Source: The site is filled land.

5. Will the project generate or convey sanitary sewage? No ______ Yes ______

   If Yes: Quantity: 6500 ______ gallons per day

   Disposal by: (a) Onsite septic systems .... Yes ______ No ______

   (b) Public sewerage systems (location; average and peak daily flows to treatment works) .... Yes ______ No ______

   Explanation and Source:

6. Might the project result in an increase in paved or impervious surface over a sole source aquifer or an aquifer recognized as an important present or future source of water supply?

   Explanation and Source: The existing site has a building on part of it and the rest of the site is a paved parking lot.

7. Is the project in the watershed of any surface water body used as a drinking water supply?

   Explanation and Source: The existing site has a building on part of it and the rest of this site is a small paved parking lot and undeveloped land.

8. Are there any public or private drinking water wells within a 1/2-mile radius of the proposed project?

   Explanation and Source: The site is an urban site in Boston and there are no known wells within 1/2 mile of the site.

9. Does the operation of the project result in any increased consumption of water?

Approximate consumption 6500 gallons per day. Likely water source(s) ____________

Explanation and Source:

Water source will be from the City of Boston water source.

E. Solid Waste and Hazardous Materials

1. Estimate types and approximate amounts of waste materials generated, e.g., industrial, domestic, hospital, sewage sludge, construction debris from demolished structures. How/where will such waste be disposed of?

Explanation and Source: Quantity and type unknown at this time.

2. Might the project involve the generation, use, transportation, storage, release, or disposal of potentially hazardous materials?

Explanation and Source: Quantity and type unknown at this time.

3. Has the site previously been used for the use, generation, transportation, storage, release, or disposal of potentially hazardous materials?

Explanation and Source: The site was disturbed when the old Orange Line tunnel system was built, and when the old Don Bosco school was constructed.

F. Energy Use and Air Quality

1. Will space heating be provided for the project? If so, describe the type, energy source, and approximate energy consumption.

Explanation and Source: The source of the heat will be steam that will be converted to hot air ant to hot water.

2. Will the project require process heat or steam? If so, describe the proposed system, the fuel type, and approximate fuel usage.

   Explanation and Source: Fuel for emergency generator and steam for sterilizat

3. Does the project include industrial processes that will release air contaminants to the atmosphere? If so, describe the process (type, material released, and quantity released).

   Explanation and Source: See attach 8A

4. Are there any other sources of air contamination associated with the project (e.g. automobile traffic, aircraft traffic, volatile organic compound storage, construction dust)?

   Explanation and Source: They will be construction dust, but the dust will be controlled through wetting down the debris, enclosed chutes, etc.

5. Are there any sensitive receptors (e.g. hospitals, schools, residential areas) which would be affected by air contamination caused by the project?

   Explanation and Source: There should be no air contamination. The Owner is a hospital. There is a school that is bounded by the Turnpike on the South side. There is a residential area that is bounded by the Turnpike on the South side, and the Expressway on the East.

G. Noise

1. Might the project result in the generation of noise?

   (Include any source of noise during construction or operation, e.g., engine exhaust, pile driving, traffic.)

   Explanation and Source: There will be construction noise caused by equipment and building erection.

E3. Does the project include industrial processes etc.

By following the general guidelines for exhaust ventilation design and training workers to use the proper work procedure when on the roof of the laboratory building, there should be no significant hazard from the exhaust ventilation at the roof level. The laboratory administration should work closely with the safety office and the facility maintenance office to implement these guidelines.

For the laboratory workers periodic review of the work practices and use of chemicals should be done. Air sampling should be done to document personnel exposures and to determine the effectiveness of local exhaust ventilation.

2. Are there any sensitive receptors (e.g., hospitals, schools, residential areas) which would be affected by any noise caused by the project?

Explanation and Source: The Owner, a hospital, is the closest abutter. Steps will be taken to control noise.

3. Is the project a sensitive receptor, sited in an area of significant ambient noise?

Explanation and Source: No.

H. Wind and Shadow

1. Might the project cause wind and shadow impacts on adjacent properties?

Explanation and Source: The new buildings will be signigicantly lower than several near by buildings, so wind should not be much of a factor. Shadows will be generated on the Owners property on the North and East sides. The West side is Washington Street.

I. Aesthetics

1. Are there any proposed structures which might be considered incompatible with existing adjacent structures in the vicinity in terms of size, physical proportion and scale, or significant differences in land use?

Explanation and Source: No. The size of the buildings is consistent with the Draft Zoning for the Chinatown area.

2. Might the project impair visual access to waterfront or other scenic areas?

Explanation and Source: There are no views to the waterfront or other scenic areas that will be impaired.

IV. CONSISTENCY WITH PRESENT PLANNING

Discuss consistency with current federal, state and local land use, transportation, open space, recreation and environmental plans and policies. Consult with local or regional planning authorities where appropriate.

Permanent new zoning will soon be adopted. This project is consistent with the proposed new zoning. NEMC is in the final stages of updating their Master Plan. For the past sixteen months or so discussions have been ongoing with the Chinatown Neighborhood and its committees as well as with the Boston Redevelopment Authority. An updated traffic study is about to start. This will be done in conjunction with the BRA. Foot traffic has been looked at and paths for the community have been identified and will be respected. Open spaces will be created as part of Phase 2 and Phase 3 development. The Washington Street streetscape will be further upgraded with planting and lighting.

V. FINDINGS AND CERTIFICATION

A. The public notice of environmental review has been/will be published in the following newspaper(s):

(NAME) Boston Globe	(Date) September 7, 1989
Sampan	September 6, 1989

B. This form has been circulated to all agencies and persons as required by 301 CMR 11.24.

8/10/89 — Anne Levine
Date — Signature of Responsible Officer or Project Proponent

Anne Levine
Name (print or type)

Address 750 Washington Street
Boston, MA 02111
Telephone Number 956-7576

8.1.89 — Craig Parkhill
Date — Signature of person preparing ENF (if different from above)

Craig Parkhill
Name (print or type)

Address 192 Worcester Road
Natick, MA 01760
Telephone Number 237-4300

FORMS OF NOTICE

(1) PUBLIC NOTICE OF ENVIRONMENTAL REVIEW

PROJECT: Project: 1-C Phase 1
(Brief description of project)

LOCATION: Washington Street, Oak Street and Ash Street

PROPONENT: New England Medical Center Hospitals, Inc.

The undersigned is submitting an Environmental Notification Form ("ENF") to the Secretary of Environment
Affairs on or before September 10, 1989
(Date)

This will initiate review of the above project pursuant to the Massachusetts Environmental Policy Act ("MEPA
G.L. c. 30, secs. 61, 62-62H). Copies of the ENF may be obtained from:

Anne Levine, New England Medical Center Hospitals, Inc., 750 Washington St., 617-956-7
(Name, address, phone number of proponent or proponent's agent)

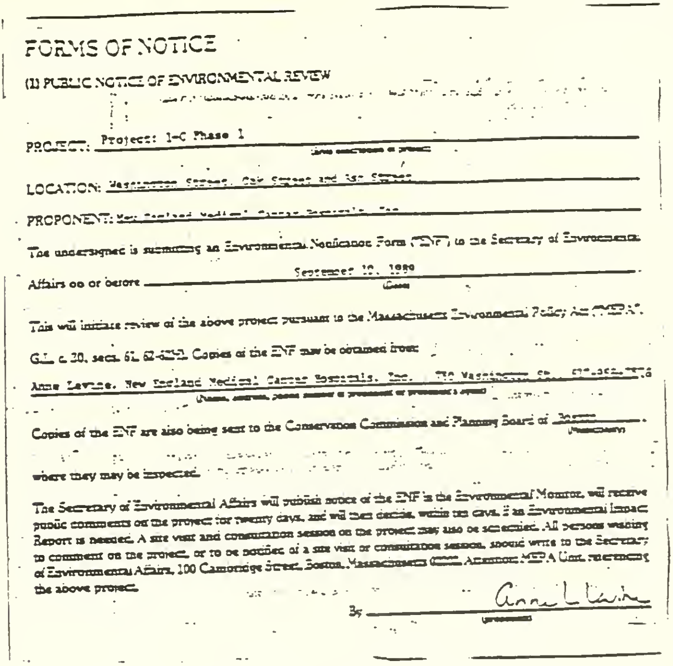
Copies of the ENF are also being sent to the Conservation Commission and Planning Board of Boston
(Municipality)

where they may be inspected.

The Secretary of Environmental Affairs will publish notice of the ENF in the Environmental Monitor, will rece
public comments on the project for twenty days, and will then decide, within ten days, if an Environmental Imp
Report is needed. A site visit and consultation session on the project may also be scheduled. All persons wish
to comment on the project, or to be notified of a site visit or consultation session, should write to the Secret
of Environmental Affairs, 100 Cambridge Street, Boston, Massachusetts 02202, Attention: MEPA Unit, referenc
the above project.

By Anne L Levin
(proponent)

Notice was published in the Sampan on



FORMS OF NOTICE

(1) PUBLIC NOTICE OF ENVIRONMENTAL REVIEW

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[illegible]

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Anne Levine, New England Medical Center Hospitals, Inc. 750 Washington St. [illegible]
[illegible]

Copies of the ENF are also being sent to the Conservation Commission and Planning Board of Boston
(Municipality)

where they may be inspected.

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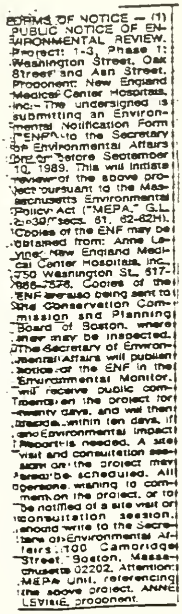
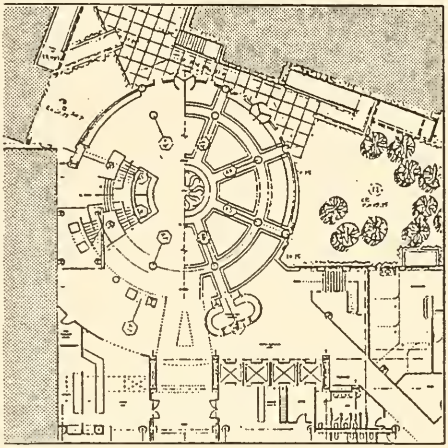
By Anne L Levine
(proponent)

Notice was published in the Boston Globe on Thursday, September 7, 1989



FORMS OF NOTICE — (1) PUBLIC NOTICE OF ENVIRONMENTAL REVIEW. Project: 1-3, Phase 1: Washington Street, Oak Street and Ash Street. Proponent: New England Medical Center Hospitals, Inc. The undersigned is submitting an Environmental Notification Form ("ENF") to the Secretary of Environmental Affairs on or before September 10, 1989. This will initiate review of the above project pursuant to the Massachusetts Environmental Policy Act ("MEPA," G.L. c. 30, secs. 61, 62-62H). Copies of the ENF may be obtained from: Anne Levine, New England Medical Center Hospitals, Inc., 750 Washington St., 617-956-7578. Copies of the ENF are also being sent to the Conservation Commission and Planning Board of Boston, where they may be inspected. The Secretary of Environmental Affairs will publish notice of the ENF in the Environmental Monitor, will receive public comments on the project for twenty days, and will then decide, within ten days, if an Environmental Impact Report is needed. A site visit and consultation session on the project may also be scheduled. All persons wishing to comment on the project, or to be notified of a site visit or consultation session, should write to the Secretary of Environmental Affairs, 100 Cambridge Street, Boston, Massachusetts 02202. Attention: MEPA Unit, referencing the above project. ANNE LEVINE, proponent.



Appendix K: Circulation List

APPENDIX K - PROJECT IMPACT REPORT CIRCULATION LIST

As designated by the MEPA Filing and Publication Regulations, 301 CMR 11.00-12.00, 1/9/87, copies of this Project Impact Report will be sent to the following agencies:

Federal:

Environmental Protection Agency - 1 copy

State:

Massachusetts Executive Office of Environmental Affairs, MEPA Unit - 3 copies
Massachusetts Department of Environmental Protection - 1 copy
Massachusetts Water Resources Authority - 1 copy
Department of Public Health - 1 copy
Massachusetts Department of Public Safety - 1 copy
Board of Elevator Regulations - 1 copy

Local:

Boston Redevelopment Authority - 15 copies
Boston Water & Sewer Commission/ Board of Health - 1 copy
Boston Inspectional Service Department - 1 copy
Boston Air Pollution Control Commission - 1 copy
Boston Public Improvements Commission - 1 copy

Community:

South Cove/Chinatown Neighborhood Council Land Use Committee - 8 copies

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